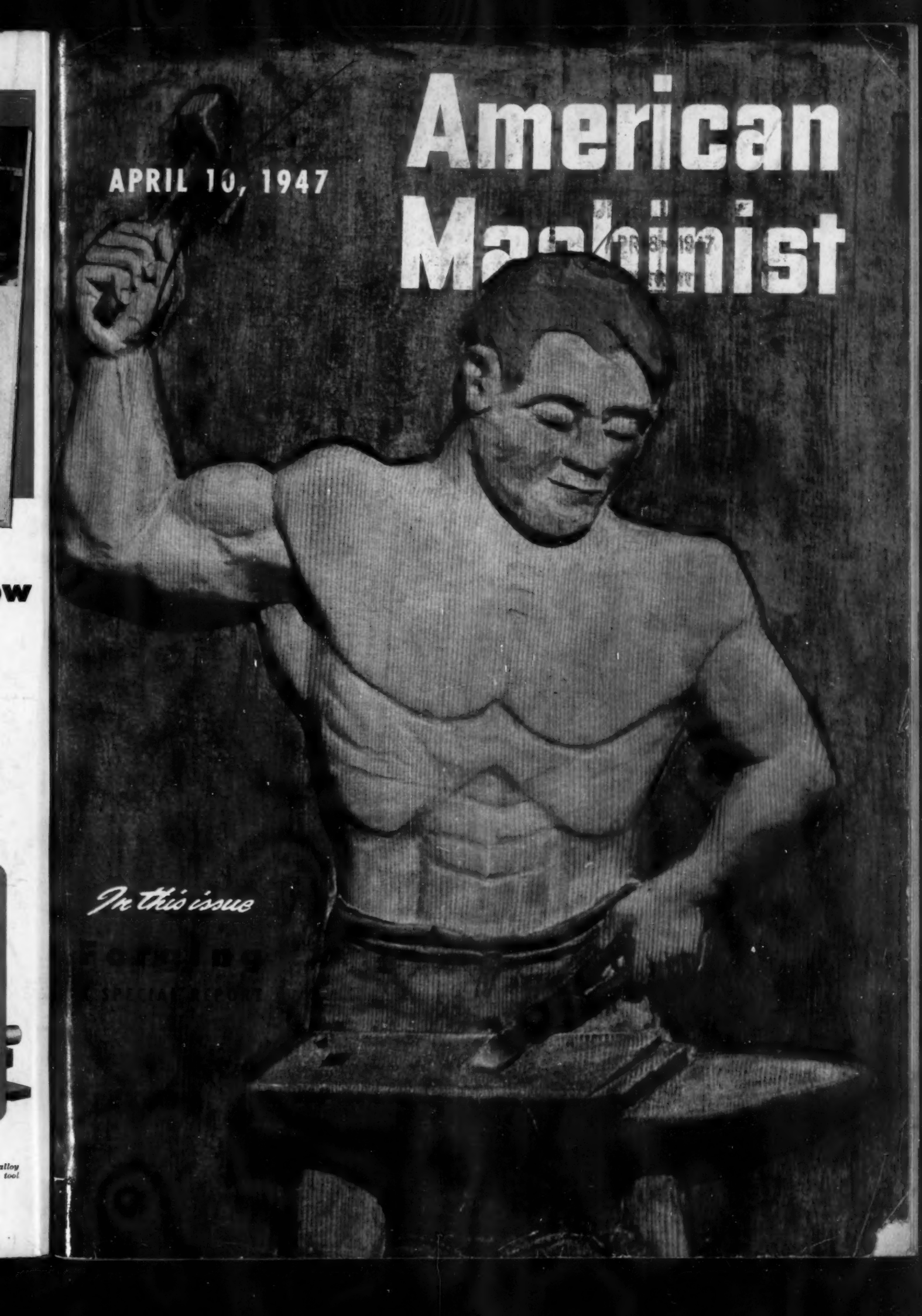

American
Machinist
APRIL 10, 1947
In this issue

This Assembly Undergoes 19 FINISHING OPERATIONS at once!

Its mating parts fit together perfectly after one complete Bore-Matic cycle

HERE'S HOW a vacuum cleaner manufacturer achieves the balanced production of assembly units needed to speed his output and cut operating costs. He uses a single Heald No. 49 Double End Bore-Matic to finish mating parts at 3 separate stations, in *one* automatic cycle. Altogether, this machine performs 19 various finishing operations, including boring, plunge facing, chamfering and turning—each to extremely close tolerances.

Intricate tooling setups like this one, worked out by experienced Heald engineers, can mean valuable indirect savings as well as greater production in your own work. For they produce uniformly accurate results which reduce scrap to a minimum, assure a fine finish, and speed final assembly. All finished parts match perfectly, providing a balanced output of parts and eliminating the need for costly hand fitting and selective assembly.

If you manufacture mating parts, or any other high precision product, let Heald engineers show you where the most accurate production methods are often the fastest and most economical. Get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

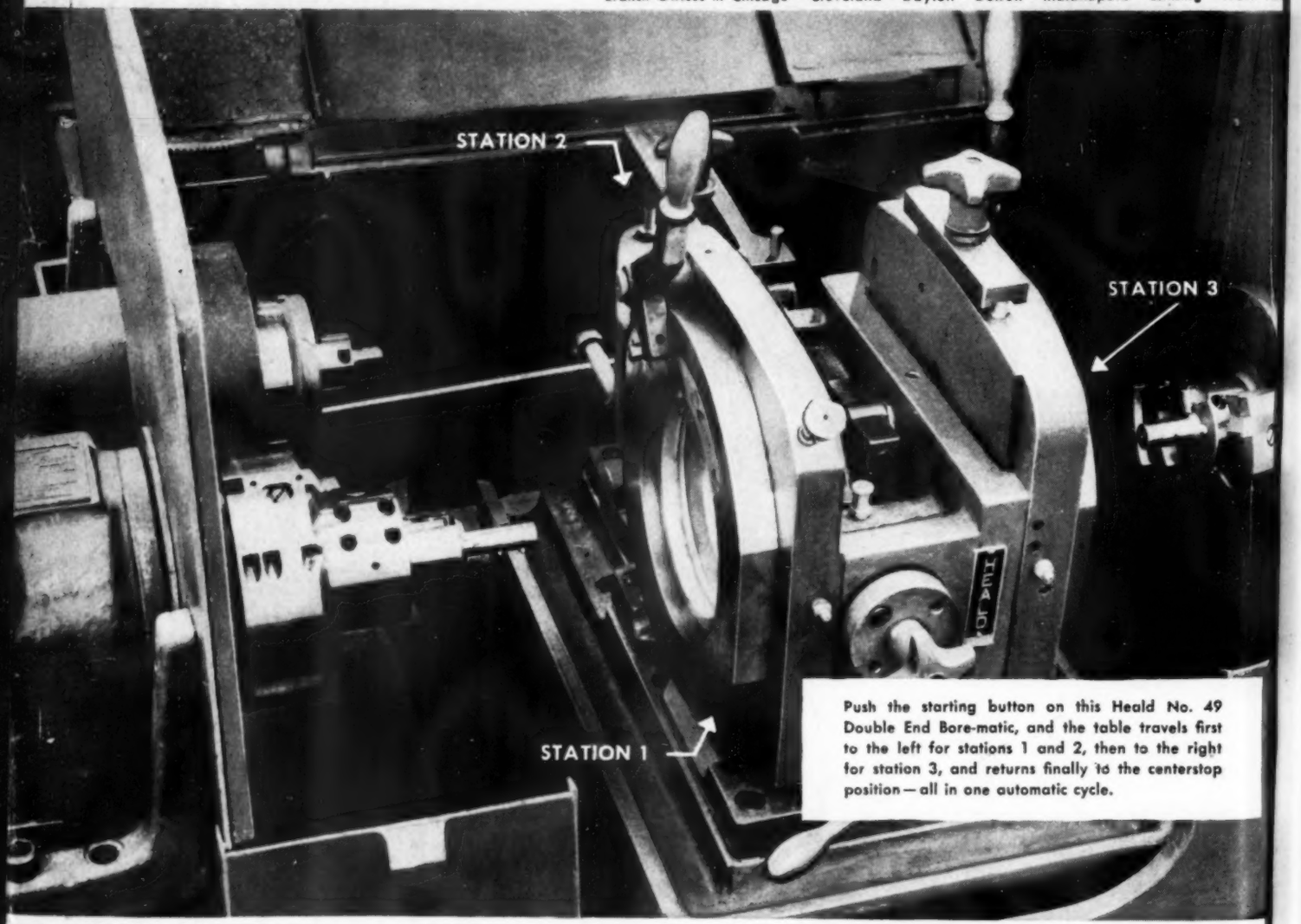
STATIONS 1 and 2

STATION 3

HEALD

means more precision . . . less cost

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New Yor



Push the starting button on this Heald No. 49 Double End Bore-matic, and the table travels first to the left for stations 1 and 2, then to the right for station 3, and returns finally to the centerstop position—all in one automatic cycle.

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Chips and QUIPS

Mighty Man . . . This issue brings you the first half of our comprehensive 32-page special report on forging, covering equipment types and tooling. The second part, to be published May 8, will cover operation and use. To symbolize forging, our cover pictures the blacksmith—who not too many years ago did all the forging.

The blacksmith was whittled out of an old piece of fir shelving by Managing Editor Tangerman (see biog.) and toned with oil pigments by Mrs. Tangerman. For the art-minded, the plaque is a low-relief wood carving on a high base, to give deep shadows with the essentially front lighting necessary to bring out the grain of the wood. Coloring, normally replaced in modern sculpture by deep carving to obtain contrast, was necessary for full-color treatment. The red hair is a bow to Andy Ashburn, whose unremitting toil during the past several months made this report possible. Kodachrome by the McGraw-Hill Studios.

For Management . . . O. M. Lund, works manager of Barrett-Cravens, describes their system of production control, based on coded stencils. Ben Brosheer, *A.M.* western editor and an old production-control man himself, saw the system working, couldn't rest until he got the story . . . There are also two other management specials: O. C. Cool, president of the Labor Relations Institute, outlining practical grievance procedure to head off strikes, and the wage-incentive plan at Reed-Prentice, which includes supervision, thus overcomes a major objection to some plans . . . These are newcomers to our contributors' list, last year totaling 377 men.

Production Tooling . . . Six operations produce 2000 gear sectors a day at 1900 Corporation. All machines but one are standard; efficiency is built by special tooling, handling and careful balancing to avoid pileups between operations. Pictures and captions save your reading time . . . Other machining data in the same issue include a tricky broaching job at AC Sparkplug and developments in measuring surface finish.

Still Pays . . . Our youngest and newest editorial assistant, Bob Graham, has an advertising man for a father, so naturally turned to that medium to resolve the presently insoluble New York problem of finding a place to live. His smart, offset-printed handbill explained he had the girl picked, but no threshold to carry her over. In two weeks, he had the apartment, two weeks thereafter did the traditional materials-handling job.

Does Anyone Remember? . . . Away back in 1880, the *American Machinist* carried small advertisements of "Patent Pressed Gearing" by J. Comly of Lincoln Park, N. J. There were no details, simply an illustration of a herringbone gear which resembled the Anderson rolled gear first made in Dayton about 1912. Fred Colvin thinks it would be interesting to know how J. Comly made his gears.

"Beefing" Can Be Wrong . . . Our Detroit technical man, Chester Ricker, picked several design points from one paper at the recent meeting of the Institute of Aeronautical Sciences, adds his sketches for a short that will interest both engineers and shop men . . . To provide an April Fool smile, we present some apprentice boners culled by Josiah Davies from first-year apprentice papers. Some of them will make your hair curl.

Coming . . . Analyzing and setting up carbide-milling jobs will be our special report for April 24. To do H. A. Frommelt's report justice, we're giving it 24 fact-crammed pages . . . In the same issue will be a picture story of fabrication of plastics for auto-body styling, the explanation of the toolroom incentive system worked out at S. S. White, and a discussion of the foreman's vital role in equipment selection.

WORD WHITTLER . . . E. J. Tangerman, managing editor, was apprenticed at 16 after summers odd-jobbing, printer's devilling, carpentering and camp-counseling. Usual small-shop machinist, apprenticeship (including periods as electrician, craneman, riveter, boilermaker, blacksmith, die setter, die maker and millwright) provided funds for two degrees "with distinction" from Purdue, BSME and ME. Editing the college daily there pushed him into the word business, on *American Machinist, Product Engrg., Power and Mill Supplies* during the last 18 years. He edited *Wings and Overseas Digest* during the late war, has also bubbled over into *Popular Mechanics, Popular Science, Science Illustrated,* and advertising mags.

A registered professional engineer, he has written four books and several pamphlets. Two pamphlets (one running 750,000 copies) and two books were on whittling and woodcarving—on which he admits he's an authority.

MAINTAIN QUALITY

QUALITY IN BEVEL GEARS starts with the gear generator itself. Gleason straight bevel gear generators are built to cut gears accurately . . . to the very latest design. For example, Coniflex gears, the straight bevels with localized tooth bearing, are cut on the new Gleason straight bevel generators.

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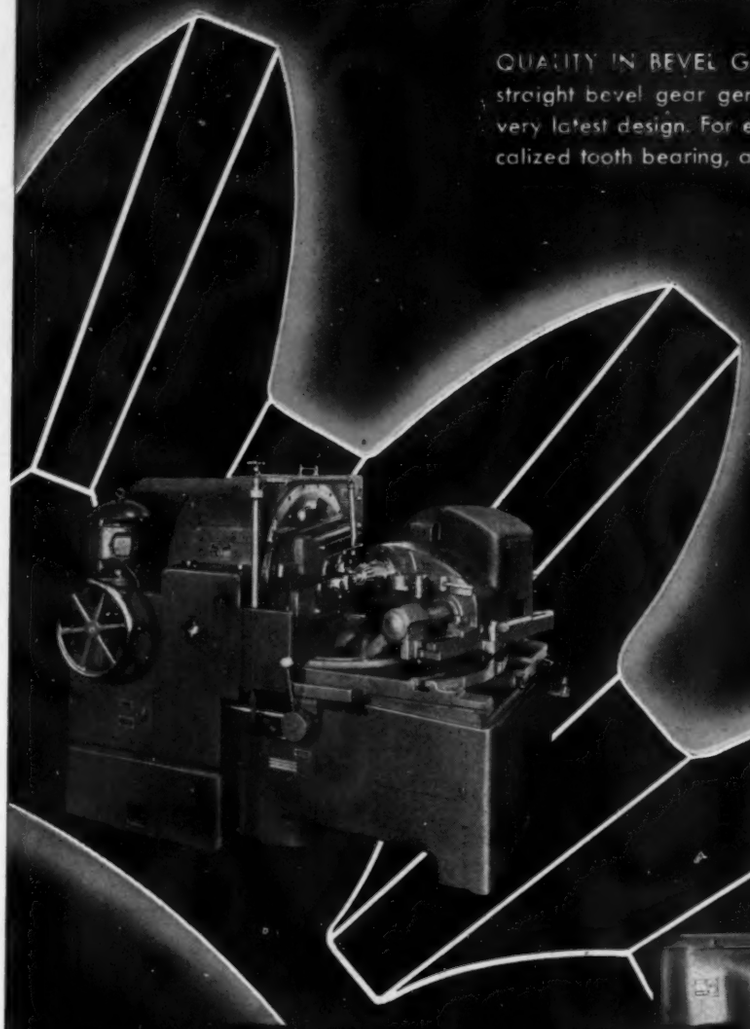

The No. 12 Generator Tool Sharpener sharpens the tools to a smoothness of surface finish and accuracy demanded by modern bevel gear applications and assures long life of the cutting tools employed.

A running test on the No. 13 Universal Tester

1. Establishes correct setup for gear generator *before production.*
2. Assures maintenance of uniform quality of gears during production.
3. Finds best position for gears in final assembly.

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Builders of Bevel Gear Machinery for Over Eighty Years

The SPEED and FEED range of the CINCINNATI NO. 2 ML is unusually wide

The new **CINCINNATI** No. 2 ML Milling Machines are made in Plain and Universal styles. Catalog M-1507-1 contains complete engineering specifications.

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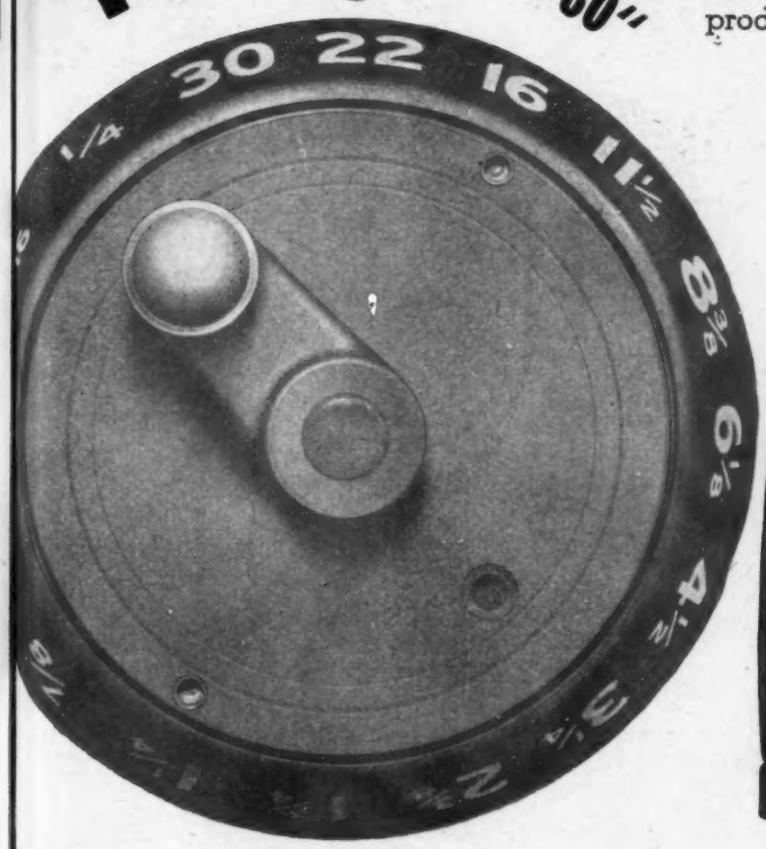
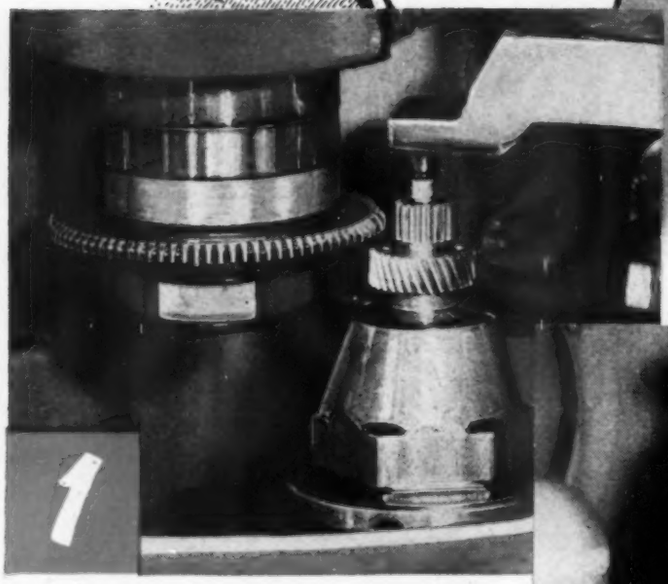


It's easy to change speeds and feeds on the new CINCINNATI No. 2 ML . . . a half turn of the crank on either dial is all that's necessary.

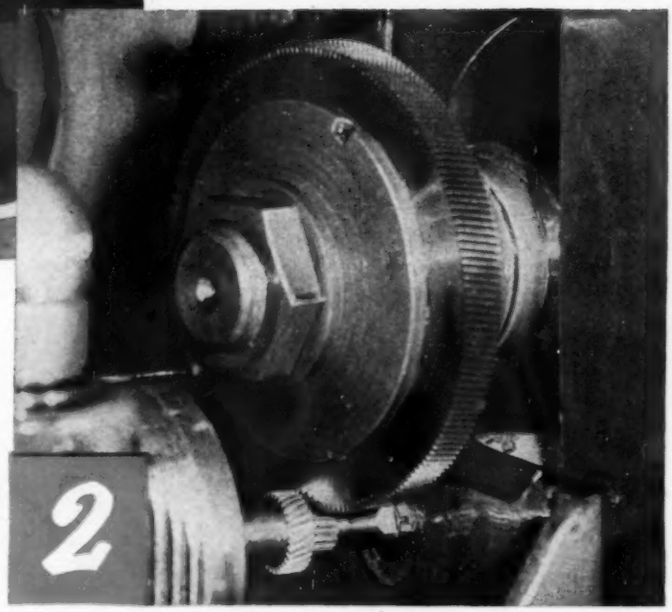
MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

HOW TO *rush* A



Cut gears accurately and economically on the Fellows Gear Shaper.

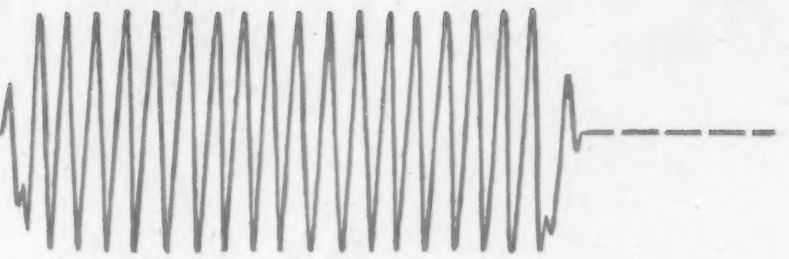


Then finish with ultra-fine precision at low cost on the Fellows Gear Shaving Machine.

● **HAVE YOU SEEN** the latest in gear science... the Fellows sound motion picture in natural color..."Highlights of the Art of Generating and Gear Manufacturing Equipment." Contact Springfield, Vermont, or our local offices for booking appointments.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

HOWL



Accurate gears properly assembled and mounted, operate more quietly than inaccurate gears. Errors in gear tooth spacing, concentricity, or profile, are conducive to noisy operation. Fortunately, such errors can be greatly reduced by shaving. Gear teeth can be held to exceedingly close tolerances in all dimensions by any manufacturer using the "Fellows Method" for cutting, shaving and inspection.

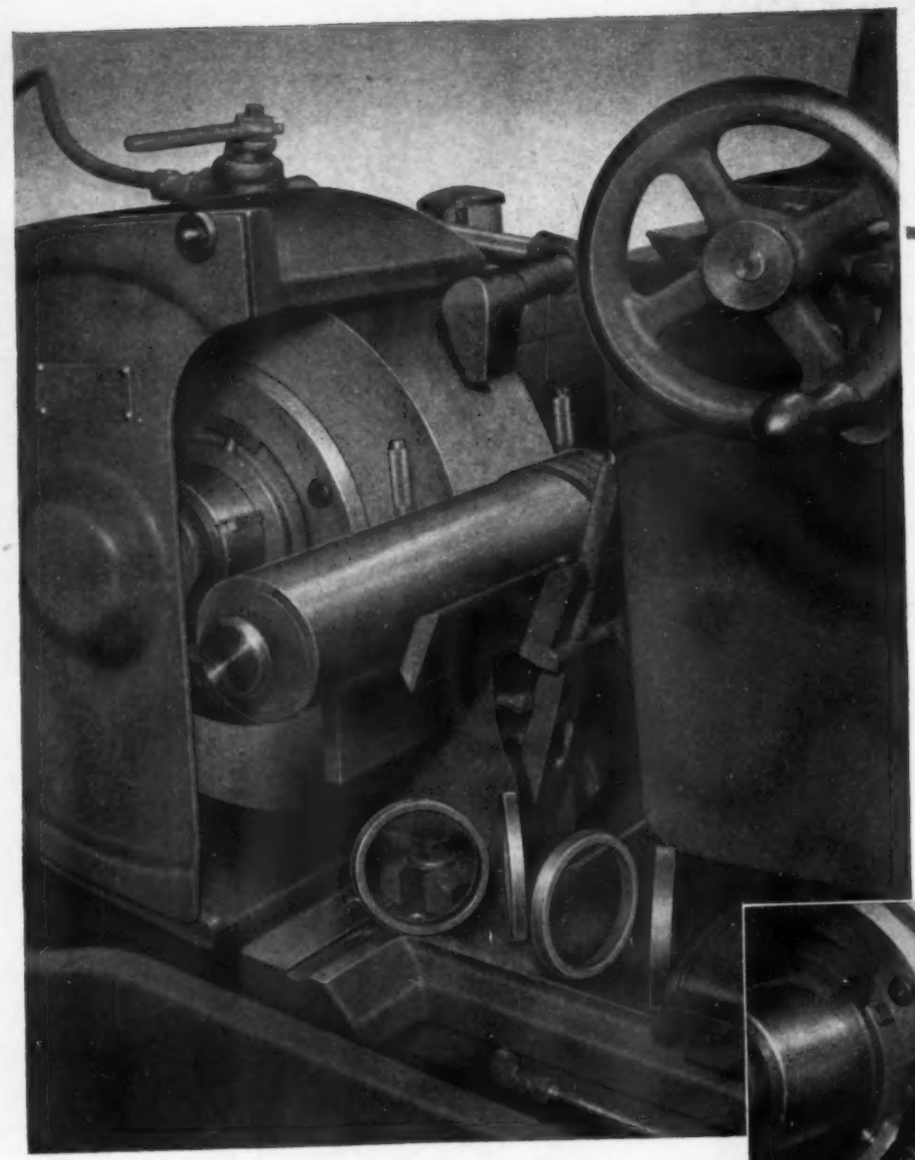
The experience of a portable drill manufacturer is typical of what the "Fellows Method" can do for those seeking to improve their products. This company, which stresses the importance of quietness in the operation of its drills, and other high-quality portable electric tools, sought a means of making its tools still more quiet than they were. A single portable tool in operation was fairly quiet, but a large number of tools operating simultaneously in the final test room produced an almost intolerable din.

The sound volume in the test room *was* reduced by an estimated *50 percent*—the nerve-wracking noise became a smooth, tolerable hum! One reason for this major improvement, is that the gears in their tools are now cut to high accuracy on Fellows Gear Shapers—then given ultra-fine tooth finishing on Fellows Gear Shaving Machines. The "Fellows Method" gave much more than a lessened sound volume in the test room. It added in no small measure to the already quiet performance and excellent service life of the company's products. It reduced production and maintenance costs, and helped make the products more appealing to users.

If you're faced with any kind of gear production problem, call on Fellows engineers freely for advice. Write for the 64-page illustrated book of ideas and techniques, "The Fellows Method". The Fellows Gear Shaper Company, Head Office and Export Department, Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; or 640 West Town Office Bldg., Chicago.

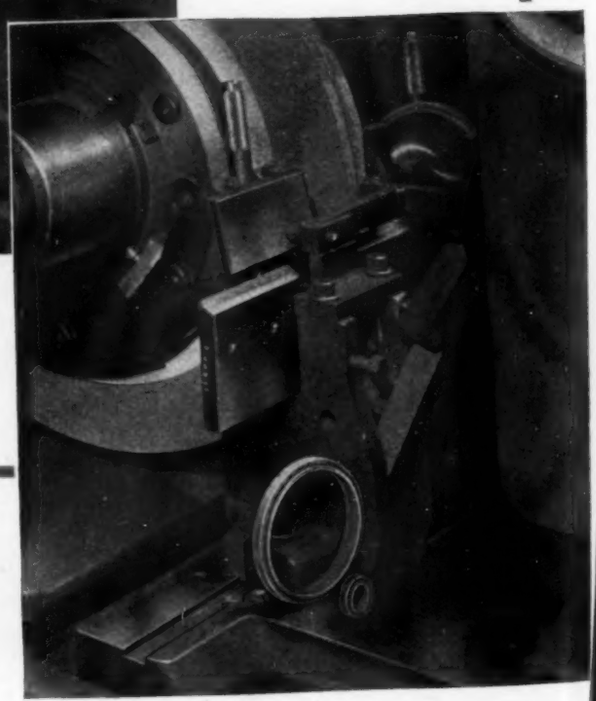
Fellows

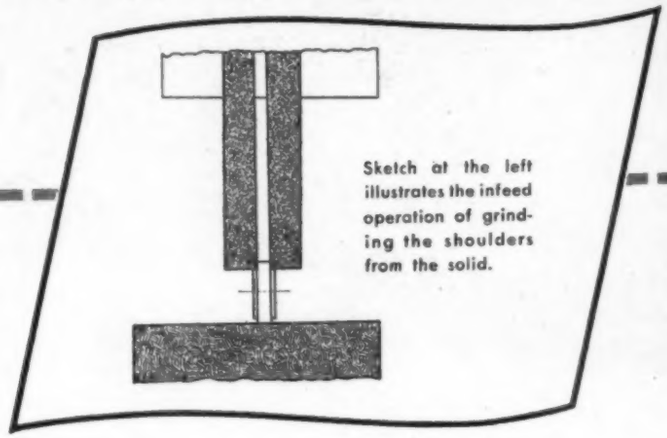
ALL OPERATIONS FROM BLANK TO FINISHED GEAR



At

CINCINNATI





Sketch at the left illustrates the infeed operation of grinding the shoulders from the solid.

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CENTER TYPE GRINDING MACHINES

2500 per hour

Eight sizes of fiber rings, 1" to 4¾" diameter by ⅜" thick, are Thru-Feed ground on a CINCINNATI FILMATIC No. 2 Centerless, using interchangeable arbors. Production is 2500 per hour. The largest arbor is on the work rest, with four rings between the wheels. Four additional rings are on the upper slide.

this rate of Production

YOU CAN AFFORD TO GRIND FIBER AND PLASTICS

300 per hour

This is the second operation . . . infeed grinding the shoulders. Special equipment consists of Work Rest and Loading Device, two Grinding Wheels and Two-Wheel Mount. Production averages 300 or more per hour. Two sizes of rings are shown near the work rest.

• Parts made of fiber and plastics are usually very inexpensive because they are molded to exact size and require few if any machining operations. Nevertheless, where extra good accuracy and finish are required, there's no need to shy away from centerless grinding operations, because CINCINNATI FILMATIC Centerless Grinders can be tooled up for extremely rapid production, and the added cost per piece is very low. ¶ An example of the productivity of these machines in grinding fiber rings is illustrated here. The machine was tooled up, ready for production, by Cincinnati Application Engineers. It's quite possible that some of the many modern centerless production techniques developed by our engineers could be employed to reduce costs in your shop. These men will be glad to analyze your requirements. We suggest that you send blueprints with complete information, or better still, arrange for a visit at your convenience.

CINCINNATI FILMATIC No. 2 Centerless Grinder. Complete specifications may be obtained by writing for catalog G-456-4.

INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

5 REASONS ...with Van Norman

No. 36 With adjustable cutterhead mounted in horizontal milling position.

"It Pays to Van Normanize"

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Ram Type Milling Machines

Adjustable Cutterhead permits you to perform horizontal, angular or vertical milling all on one machine . . . minimizes work setups . . . cuts idle operator and machine time up to 50%. In addition, this versatility enables you to meet daily job to job milling requirements.

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Long Life Accuracy is assured by the precision rigid Van Norman construction. Hardened alloy steel gears and multi-splined shafts operate on anti-friction bearings . . . automatic lubrication assures thorough oiling of all moving parts . . . massive knee, saddle and table assemblies provide rigidity.

Investigate Van Norman Ram Type Millers today. They are available in many models and sizes, with plain or universal saddles, to meet every requirement for toolroom, laboratory, machine shop, pattern shop and general purpose milling.

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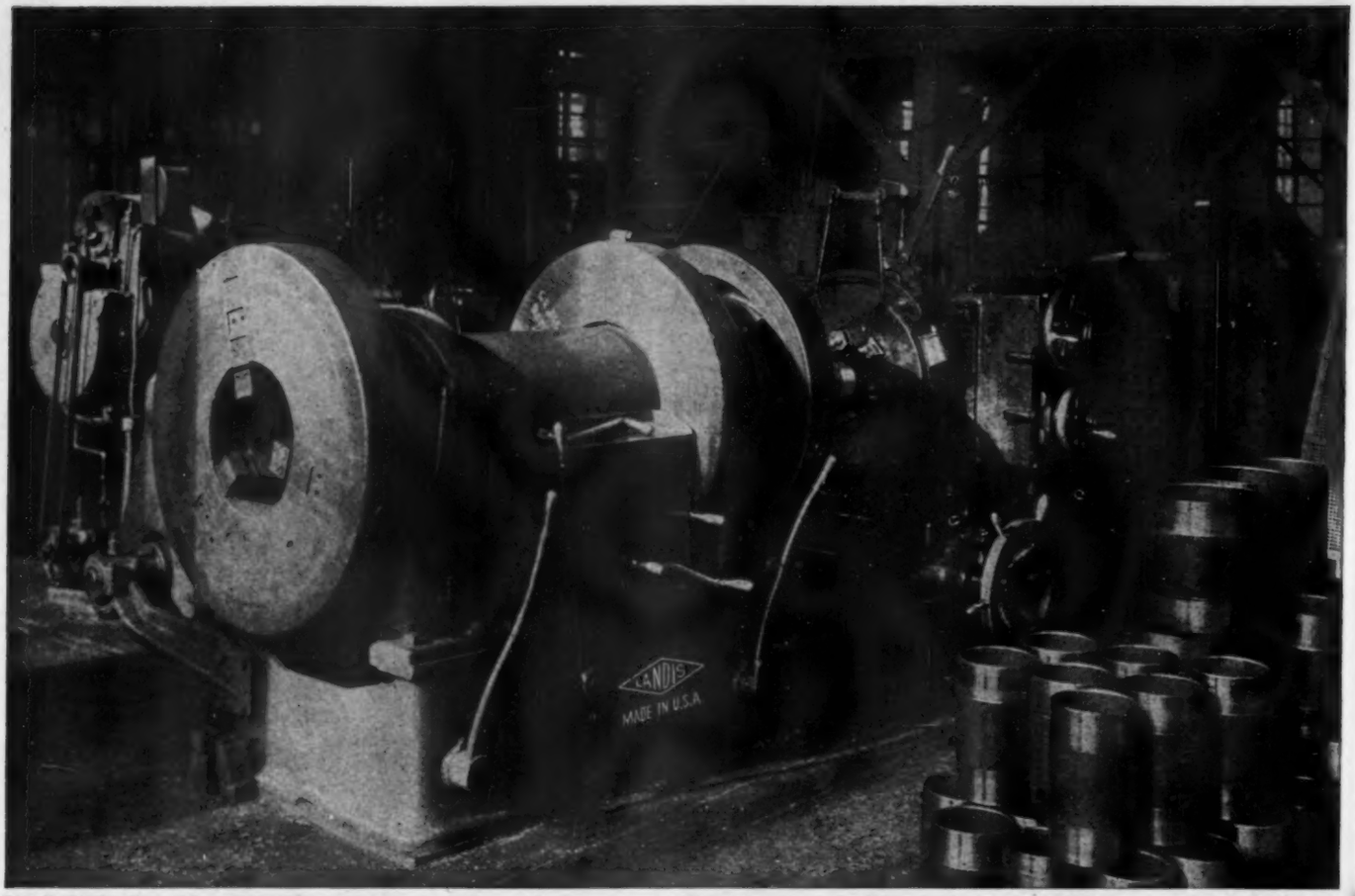

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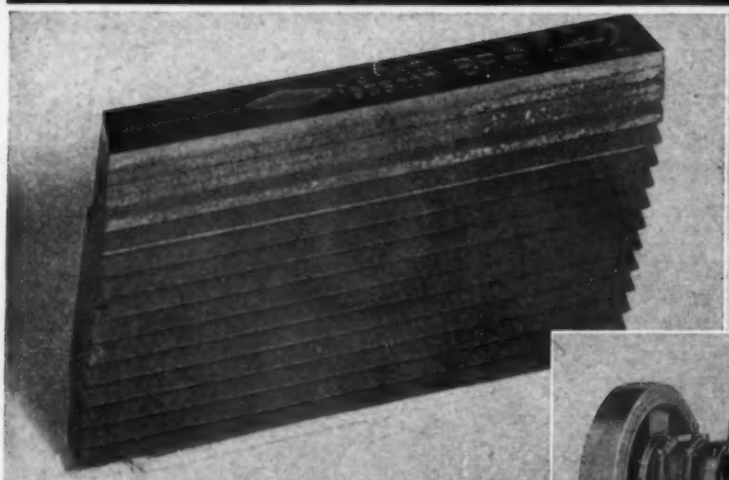
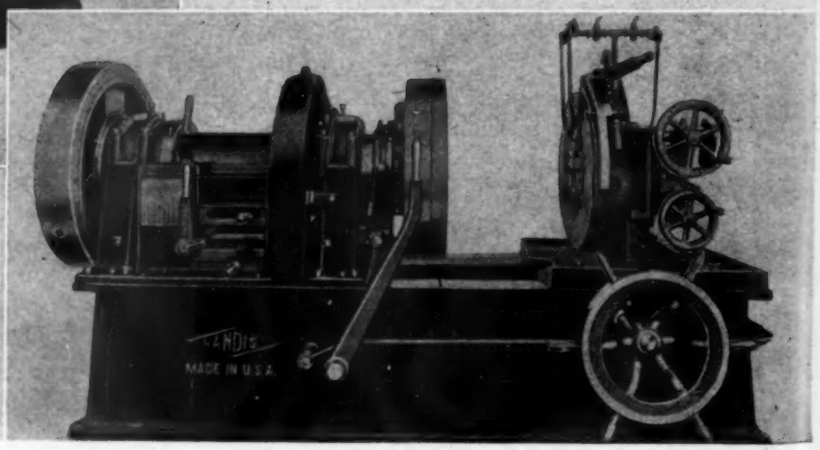


The Landis Stationary Die Heads applied to our Pipe Threading and Cutting Off Machines minimize spoilage—insure high degree concentricity due to floating action of die head in T-slot of cross rail.

Landis Tangential Pipe Chasers employed in Stationary Head—one set chasers required to cover range of die head—eliminates the changing of chasers for each diameter of threads produced—assuring accurately formed threads and low threading cost.



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LANDIS PIPE THREADING AND CUTTING OFF MACHINES

Saves time—cuts cost—insures accuracy—in the production of pipe threads.
For heavy duty, continuous service—built in nine different sizes ranging from 2" to 20" inclusive.

Designed for flexibility in threading all diameters of pipe within their range.

Employs eight speed selective type gear box with cut steel gears—operating in continuous bath of oil—having reversing control.

Front and rear chucks fitted with renewable rocket type grip inserts, replaceable at minimum cost. Gripping chucks with universal adjustment on 2" to 12" machines.

Here's the Pipe Threading and Cutting Off Machine you will find a profitable investment for production, jobbing, and maintenance pipe threading operations.

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Waynesboro, Penna.

SAN FRANCISCO
Jenison Mchy. Co.
20th & Tennessee Sts.

SEATTLE
Dawson Mchy. Co.
2737 First Ave., South

SYRACUSE
Syracuse Supply Co.
314-324 W. Fayette St.

TOLEDO
Oatis-Booth Mchy Co.
Richardson Bldg.

WICHITA
White Star Mchy. & Supply Co., Inc.
301 N. St. Francis

CANADA

MONTREAL
Williams & Wilson Ltd.
544 Inspector Street

QUEBEC
Williams & Wilson Ltd.
Room 722, Price House
65 St. Anne St.

TORONTO
F. F. Barber Mchy. Co.
Div. Massey-Harris Co. Ltd.
York & Harbour Streets

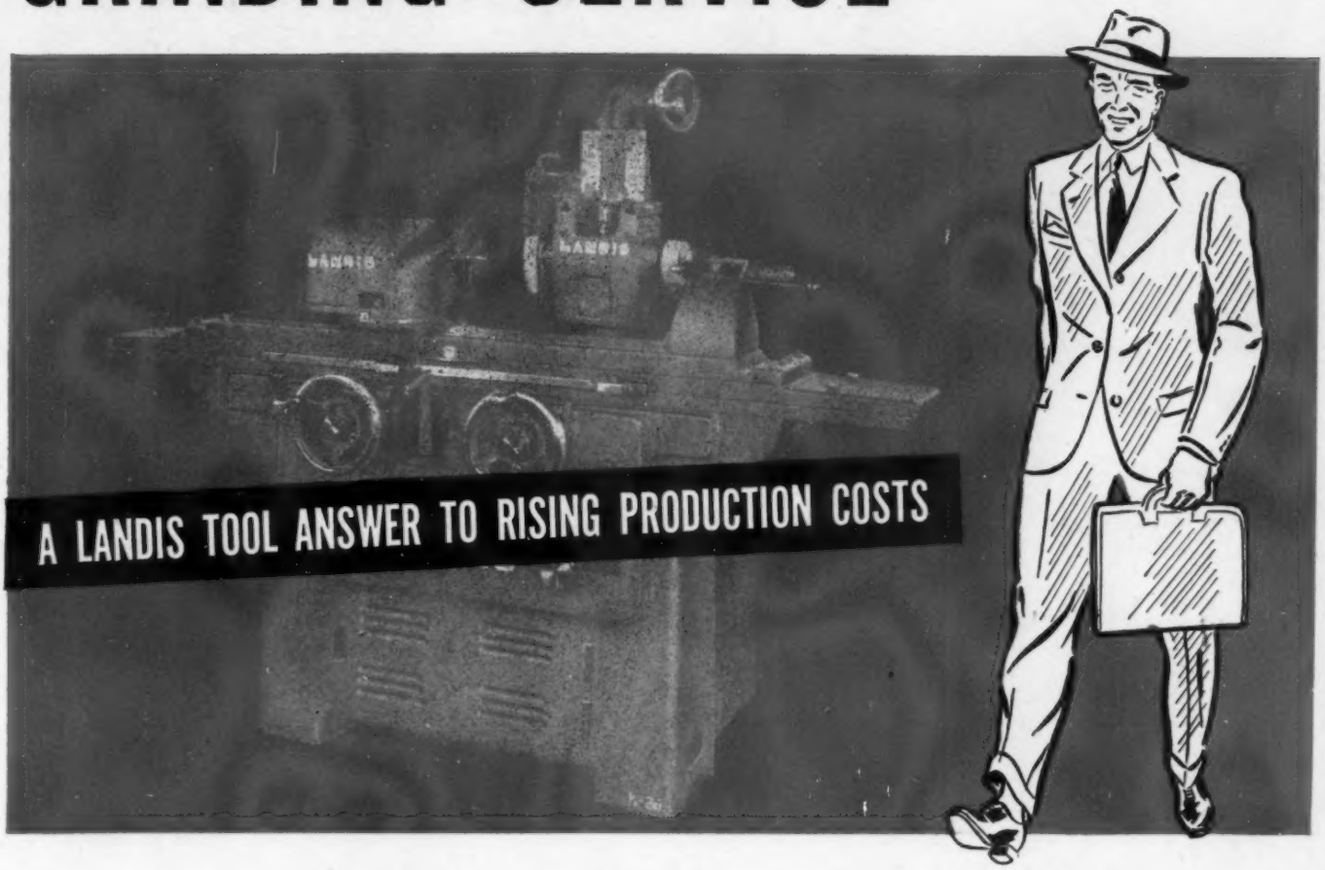
VICTORIA
G. M. Tudor & Co.
1140 Government St.

WALKERVILLE
F. F. Barber Mchy. Co.
Div. Massey-Harris Co. Ltd.
Imperial Building
Wyandotte Street

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

GRINDING SERVICE"



WHATEVER THE GRINDING JOB—**Plain Cylindrical, Taper, External, Thread, Internal, Tool Grinding, Crankshaft, Cam Shaft, Crankshaft Regrinding, Valves, Bearing Races and Roll Grinding.**

WHATEVER THE GRINDING PROBLEM—**High Production, Automatic Sizing, Fine Finish, Formed Wheel Grinding, Grinding in Two Planes, Special Work Holding Fixtures, Cost Reduction.**

Rising production costs are a tough problem. But if you have a difficult grinding problem or a production job that can be done by grinding, it will pay you to consult Landis Tool for engineered grinding service.

You will get the simplest and lowest cost solution to your problem from specialists in grinding. The standard line of over 150 types and kinds of grinders are at the disposal of the Landis Tool grinding engineer to help solve your problem. For simple between centers cylindrical work it may require a plain machine. Greater flexibility may make a universal grinder desirable. The following may be needed for special production requirements: Centerless grinder, centerless thread grinder, angle wheel base, rapid infeed, special work holding fixtures.

In addition you have the assurance that your Landis Tool precision grinder will have all the finest and latest features that give high production to close tolerances with a fine finish. For help on your grinding problem, consult your nearest Landis Tool representative or write direct. 47

WAYNESBORO, PENNA.

CENTERLESS GRINDERS TOO, BY LANDIS TOOL...OF OUTSTANDING NEW DESIGN. WRITE FOR CATALOG T44

LANDIS TOOL *Company*

Reg. U. S. Pat. Off.

UNBRAKO

(A)

THE *Knurling* SAVES TIME EVEN WITH OILY, GREASY FINGERS

(A) The "Unbrako" Socket Head Cap Screw is a time-saver because the knurled head provides a slip- and fumble-proof grip—even for the oiliest and greasiest fingers. It can, therefore, be screwed-in faster and farther before it becomes necessary to use a wrench . . . assures a more compact, neater fastening with decided savings in material, space and cost.

(B)
Pat. and Pat. Pend.

(B) Self-Locking "Unbrako" Socket Set Screws—with knurled Cup-Point—hold fast because the knurled point digs in and stays tight, even under the most chattering vibration.

(C)
Pat'd. & Pats. Pend.

(C) "Unbrako" Socket Set Screws—with knurled threads—are also self-locking. They are for use where the point cannot be knurled. These and the Socket Head Cap Screws are available in sizes No. 4 to 1½". Write for your copy of our "Unbrako" Screw Products catalog.

Knurling of Socket Screws originated with "Unbrako" in 1934.

Kits: Pats. Pending

You can't screw socket screws in or out without a hex socket wrench—so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

"Unbrako" and "Hallowell" products are sold entirely through distributors.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

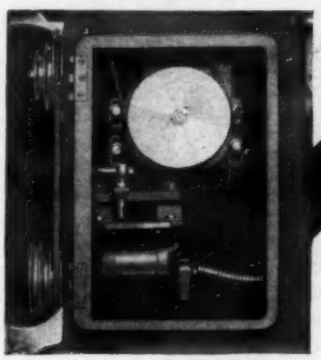
JENKINTOWN, PENNA., BOX [redacted] • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

UNIVERSAL CUTTER AND TOOL GRINDER

IMMEDIATE DELIVERIES!

COVEL NO. 22

COMPLETELY EQUIPPED WITH ALL-ELECTRIC POWER TABLE TRAVERSE AND WET GRINDING ATTACHMENT



ALL-ELECTRIC POWER TABLE TRAVERSE . . . Power from individual reversing motor drives through 3-step cone pulleys (V-belt) to gear case and through 2-step pulleys from gear case to table mechanism. Six various speeds available. All-electric system assures smooth, rapid table traverse. No clutches to wear out.

COMPLETE WET GRINDING ATTACHMENTS . . . Splash guards, pump, piping and tank for coolant are available to completely equip the 22 for wet grinding. Tank mounted on casters for easy handling and cleaning.

COVEL MANUFACTURING CO.
BENTON HARBOR, MICHIGAN

THE term *Universal* acquires a new significance when applied to the Covel No. 22 Universal Cutter and Tool Grinder. It's rugged, accurate and dependable. It's easy to set up, simple in operation and readily adaptable for fast grinding on a wide variety of jobs.

That's why tool men who need more capacity at lower costs are ordering the No. 22 Universal. We are making *immediate* deliveries from stock — *now!* Write for bulletin No. A-87 or see your nearest Covel dealer.

COVEL
INDUSTRIAL GRINDERS

MORSE All Types

No. 2039. Spiral Fluted Taps: High Speed Steel (Fractional Sizes)

No. 2063. Spiral Fluted Taps: High Speed Steel (Machine Screw Sizes)

Designed for use in aluminum, die-cast metal, soft brass, copper, and stringy metals.

No. 2040. Hand Taps: High Speed Steel —Cut Threads (Fractional Sizes)

No. 2046. Hand Taps: High Speed Steel —Ground Threads (Fractional Sizes)

No. 2066. Machine Screw Taps: High Speed Steel—Cut Threads (Machine Screw Sizes)

No. 2068. Machine Screw Taps: High Speed Steel—Ground Threads (Machine Screw Sizes)

Designed for use by hand and by machine power.

No. 2115. Taper Pipe Taps: High Speed Steel—Cut Threads

No. 2119. Taper Pipe Taps: High Speed Steel—Ground Threads

Used for tapping pipe fittings, boilers and boiler plates, etc.

No. 2115. Taper Pipe Taps: High Speed Steel—Interrupted Threads

Used in copper and stringy materials where taps tend to tear.

No. 2082. Pulley Taps: High Speed Steel—Ground Threads

Same as No. 2046 Hand Taps, but with a long shank. For use in tapping set-screw holes in pulleys with hubs. Also for tapping oil-cup holes.

MAKES of Taps... to give you Smooth, Strong Threads in any material

No. 2045. Spiral Pointed Hand Taps: High Speed Steel—Cut Threads (Fractional Sizes)
No. 2047. Spiral Pointed Hand Taps: High Speed Steel—Ground Threads (Fractional Sizes)
No. 2067. Spiral Pointed Machine Screw Taps: High Speed Steel—Cut Threads (Machine Screw Sizes)
No. 2070. Spiral Pointed Machine Screw Taps: High Speed Steel—Ground Threads (Machine Screw Sizes)
Designed for use in sheet metal. Work very well in machine tapping of thru holes in all types of materials. This type of tap forces the chips ahead of the tap, so it should not be used in tapping blind holes unless sufficient chip clearance is allowed in the bottom of the hole.

Name your material—and Morse will supply you with the tap which has the right specifications for your particular job. The Morse line of taps is *really comprehensive* . . . embracing top-quality cut-thread or ground-thread taps of every type, both standard and special, to meet *your* requirements.

What's more, when you use Morse taps, you're sure of getting *smooth, strong* threads . . . threads which hold because they're cut with precision cutting tools of the highest quality. You'll get no clogging, no damaged threads . . . and you'll get faster tapping on every job.

So make a date today with your Industrial Supply Distributor. He'll be glad to cooperate in securing a Morse recommendation, and will *save you money* by getting the exact tap you need.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

WANT A BETTER WAY TO GRIND

Use the Norton Bura-Way

NORTON GRINDERS
and Lappers

SINGLE POINT TOOLS?

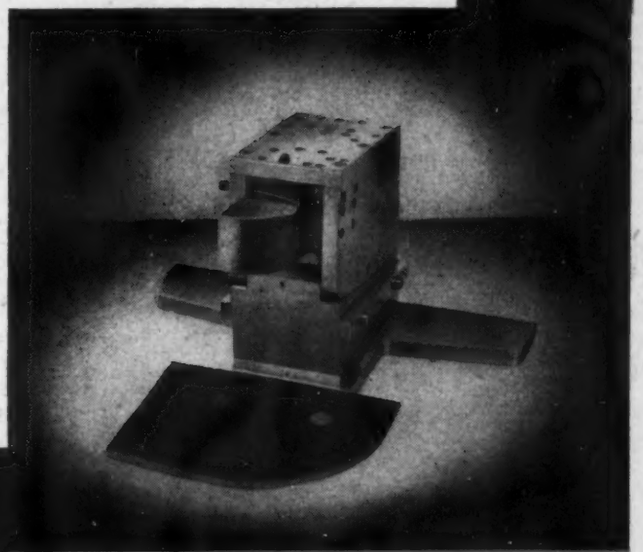
Yes — the Norton Bura-way for grinding convex single point cutting tools offers a better method of doing this highly important job. For instance, it removes the human factor in form duplication by first generating a master template or cam from a master tool. Thereafter, exact duplication of tool profile comes quickly and easily by the use of this cam.

The rugged construction of this machine insures a quality of finish that means maximum tool performance and life. It is ideal for carbide tipped tools.

Further information on request — there is no obligation.

NORTON COMPANY
WORCESTER 6, MASS.
Distributors in All Principal Cities

M-540

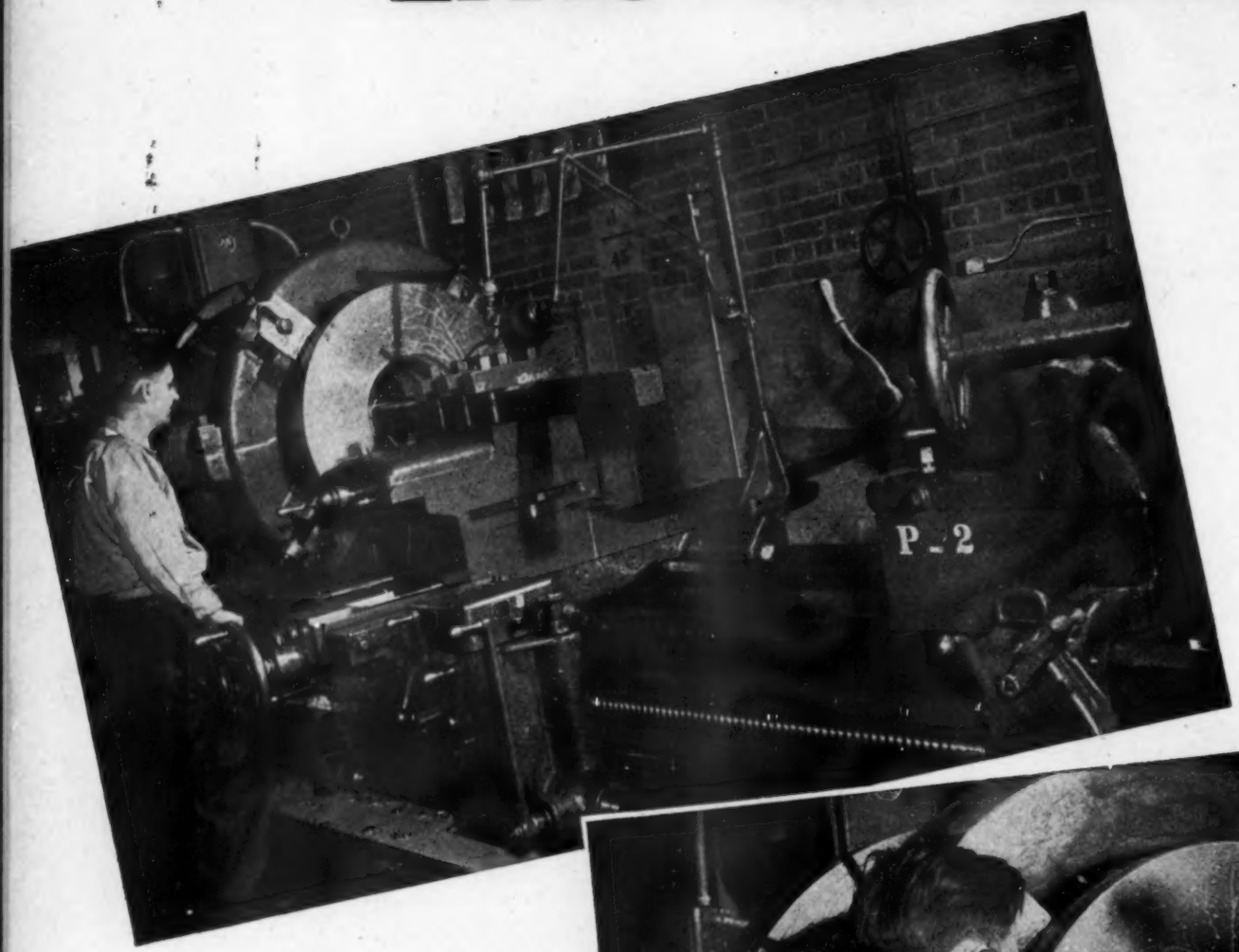


Tool holder with tool in place and generating cam at base.

STEP 1 Cutting master cam. Master tool against calibrating block, cam being cut by wheel.

STEP 2 Regrinding carbide tipped tool from master cam previously prepared as in step 1.

Like all True



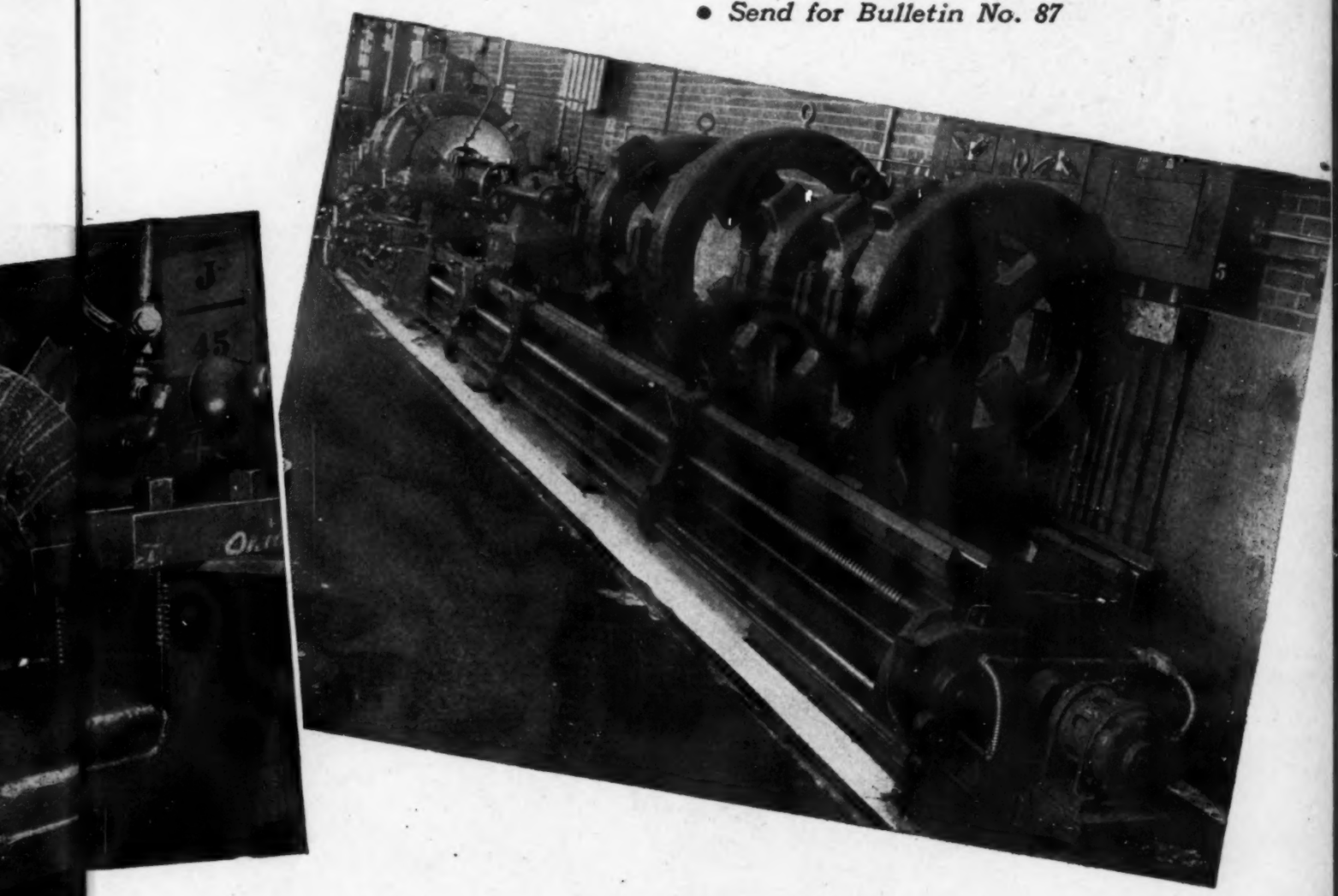
THE AMERICAN TOOL WORKS CO.

AMERICANS...

"AMERICAN" Lathes, from the smallest to the largest, are meeting the challenge of production like all true Americans. The power, stamina and endurance built into "American" Lathes have proven invaluable to many a production plant operating on an around-the-clock schedule. Dependable service, minimum shut-down for failures and repairs coupled with an almost unbelievable ability to "keep going" under any and all conditions are genuine "American" characteristics. "American" Lathes are easy to operate, too—another feature that appeals to the operator as do their simplicity of design and complete freedom from complex mechanisms and manipulations.

"American" Lathes are an asset in any plant.

• *Send for Bulletin No. 87*



co. *Lathes and Radial Drills* **Cincinnati, Ohio U.S.A.**

IF YOU USE . . . Aircraft Steels, Nitralloy

UNITED STATES

Bearing Steels, Gear Steels, or Special Analysis Alloys

—we want your business!

MAYBE you've heard about the prominent manufacturer who when asked by a salesman acquaintance, "Mr. Jones, why don't we ever get any of your business?", made this candid reply, "You never asked me for it."

We don't want to make this mistake. So we're coming right out and asking for your orders. Not entirely out of self-interest either, but because we honestly believe that you'll find it to *your* advantage to buy alloy steels from Carnegie-Illinois.

Consider this. No other single producer can offer, or equal, Carnegie-Illinois Steel Corporation's *versatility* of alloy steel production. We are completely equipped to meet ALL of your alloy steel requirements as to analysis, form, condition and treatment, and particularly to the highest quality standards.

In both our Pittsburgh and Chicago District plants we have the producing and finishing equipment to supply you with forging ingots, blooms, billets, slabs, square bars, round bars, coils, spring steel flats, bar strip, special sections, plates, strip, sheet, sketch plates and structural shapes. This duplication of facilities expedites deliveries . . . reduces shipping time and costs . . . makes it possible to fully meet all specification requirements—whether you're located in the East or West.

And, to help you use these alloy steels most efficiently, we place at your disposal the best metallurgical talent available. These men—many of them recognized authorities in the field of steel metallurgy—can call upon the facilities of the most extensive steel research laboratories in America. Their recommendations to you can be entirely unbiased because they have the most comprehensive range of metallurgy's finest quality steels from which to fill your needs.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
7-347

Did you know?

. . . A plant of the Carnegie-Illinois Steel Corporation was one of the first alloy steel producers in the United States. In 1892, fifty-five years ago, Homestead Steel Works made nickel armor for the battleship "Oregon", which saw service in the Spanish-American War.

. . . During World War II, Carnegie-Illinois developed and produced all the chromium-nickel-molybdenum-vanadium plate steel for welded torpedo flasks, thus eliminating the losses of steel and time consumed to manufacture flasks from large forgings, the usual practice.

. . . Devised and introduced hardenability bands as a means for closer control and heat treating response of both National Emergency Steels and regular standard steels.

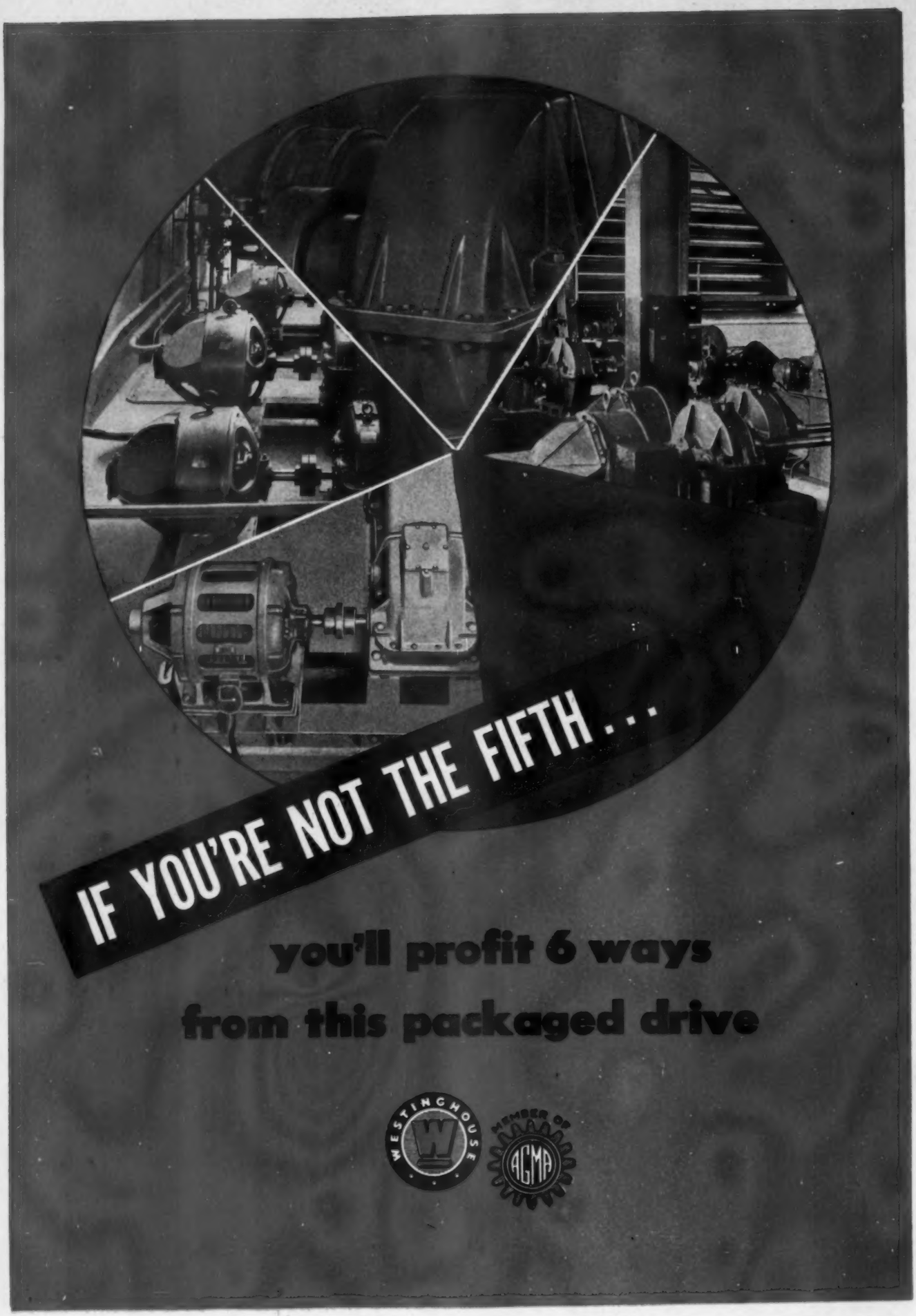
U·S·S Carilloy Steels

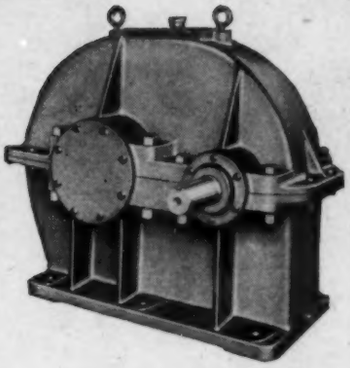
USS STEEL — UNITED STATES STEEL

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

S T E E L


IF YOU'RE NOT THE FIFTH . . .
you'll profit 6 ways
from this packaged drive
WESTINGHOUSE
MEMBER OF
AGMA



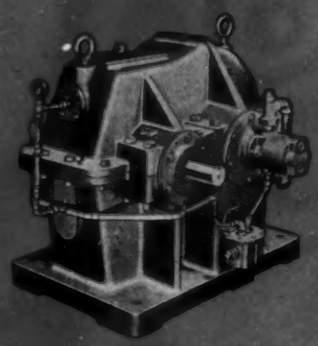
This Type SH speed reducer is a single-reduction unit which is furnished in thirteen standard ratios in each of twelve sizes. The Type DH speed reducer, which is a double-reduction unit, is offered in fifteen standard ratios in each of twelve sizes.

Because 4 out of 5 machines operate at slower speeds than their prime movers supply, you stand to gain six ways when you put Westinghouse speed reducers to work for you:

1. You step up power efficiency (one plant raised it from 80.9% to 85.4%).
2. You reduce frequent servicing of open-type drives to semi-annual lubrication of a packaged unit.
3. Maintain positive alignment of drive and driven machine.
4. Long service life through single helical gearing heat-treated by the exclusive Westinghouse BPT process.
5. Minimum power loss with anti-friction bearings.
6. Precision operation from hob-cut gears.

For drives up to 1,000 hp, you have your choice of twenty-four sizes of Westinghouse speed reducers—Types SH and DH—for speed reduction ratios from 2.82 to 70.5 . . . and you get all the benefits of unit responsibility with motor and gears supplied by one manufacturer.

Get all the facts today from your nearest Westinghouse office on the advantages you'll gain when you use these matched unit drives for all types of speed reduction. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-07251



FOR DRIVES FROM 1 TO 75 HP CHOOSE GEARMOTORS

These efficient, economical gearmotors give you the best in modern speed reduction for drives from 1 to 75 hp. Easy to install, simple to service and adaptable for all types of drives and motors. Three types—A, C and E—are available and provide output speeds of 1,450 to 16.5 rpm. All unit types can be used with either single-phase, polyphase or d-c motors.

FOR DRIVES UP TO 2,000 HP AND 9,000 RPM USE THESE SPEED INCREASERS

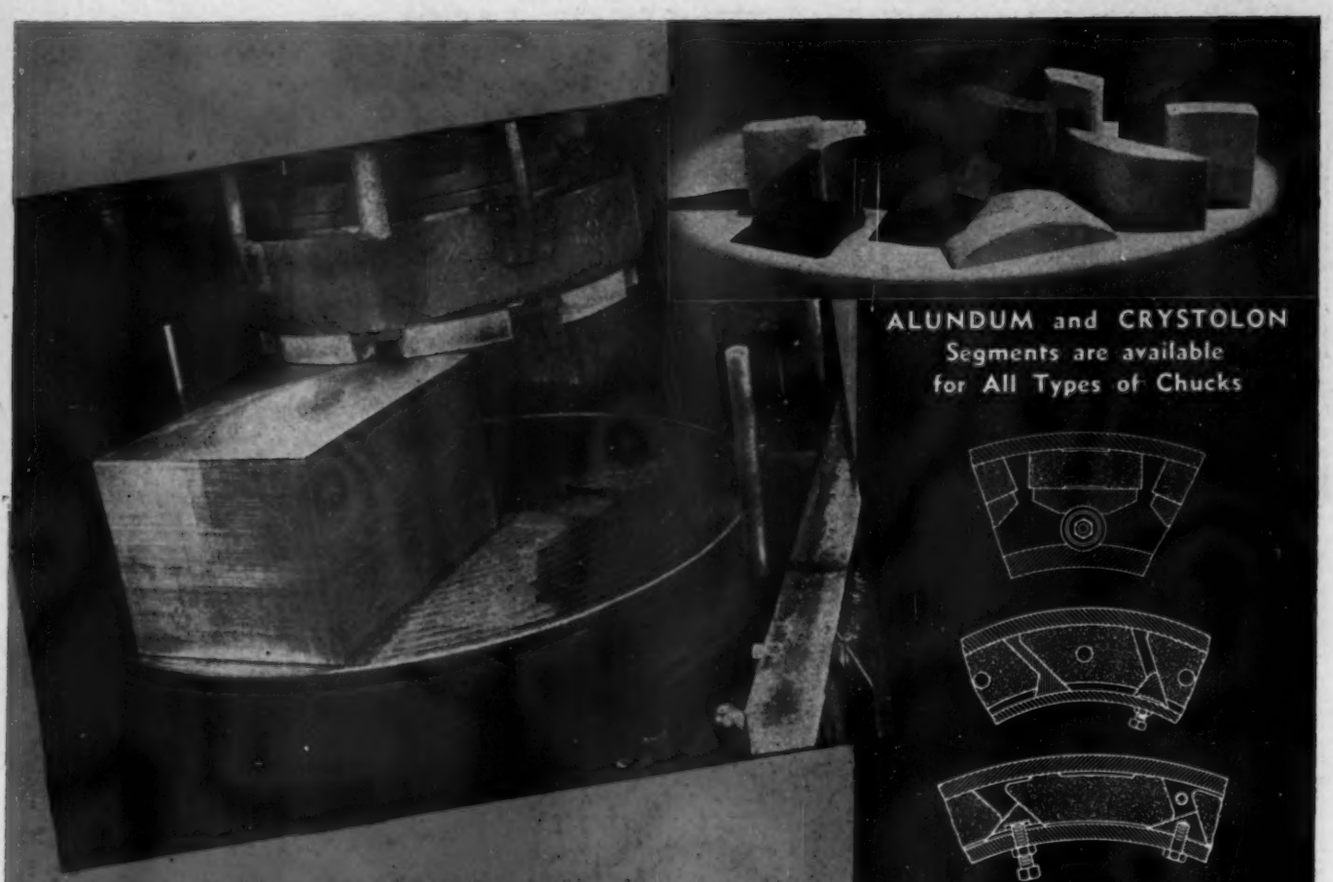
These matched-unit drives have special advantages for all industrial and commercial high-speed jobs up to 2,000 hp and 9,000 rpm. Units are available in 30 sizes with gear ratios of 1.25 to 3.25 up to 2 to 12.

The whole story of industrial geared drives and the way every industry is using them is told in this new book, profusely illustrated with actual applications. Ask for your copy of B-3730 today, on your business letterhead, please.

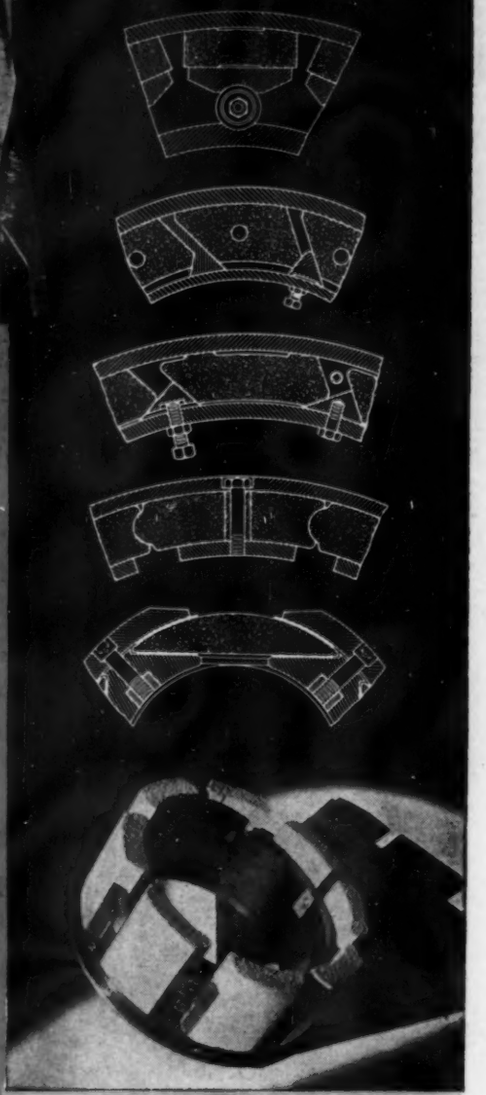
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

4 out of 5 drives need speed reduction



ALUNDUM and CRYSTOLON
Segments are available
for All Types of Chucks



Segment life doubled . . .
Grinding time cut over an hour . . .
*with the Sensational 32 ALUNDUM**

IN the plant of one of the largest producers of die castings they grind vanadium steel impression blocks on a Blanchard surface grinder equipped with a Norton chuck — removing about 3/32" of steel on each side. Segment life had been about three days per set.

When they changed to open structure segments of the new 32 ALUNDUM abrasive (32A24-F12VBEP) life jumped to *six days per set* and they save 1¼ hours grinding time on each block 24 x 24 x 6". And they report that the 32 ALUNDUM Segments are cooler cutting, too.

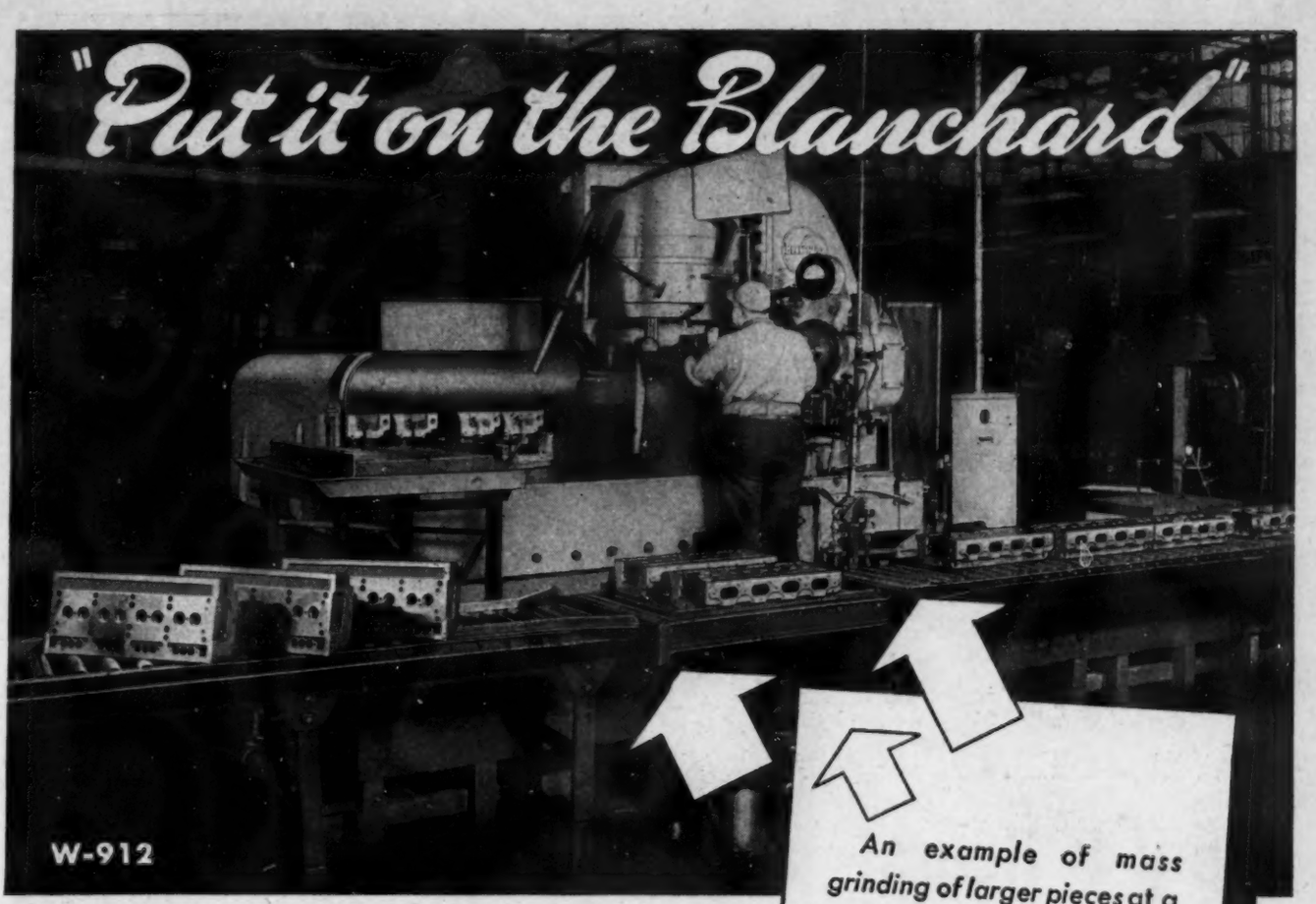
NORTON COMPANY • WORCESTER 6, MASS.
Distributors in All Principal Cities

*Trade-mark Reg. U. S. Pat. Off. W-1104

NORTON CHUCKS
Are Easy to Use

No back-up blocks nor rings are necessary —just slip the segments in place, two at a time, and tighten the clamps between them. There are two quick adjustments for wear. Available for No. 16 and 18 Blanchard, 14" Pratt & Whitney and 20" Hanchett Grinders.

NORTON ABRASIVES



An example of mass grinding of larger pieces at a greater profit.

Four diesel cylinder heads are held on a 60" magnetic chuck of a No. 27 Blanchard Surface Grinder. The material is cast iron. Each head measures 25½" x 10¼" x 5 3/16".

Average stock removal per side is .005". One side is ground flat within .001".

Production is 27 pieces (27 surfaces) per hour. This includes loading and unloading time.

THE MOST PROFITABLE WORDS IN FLAT SURFACE GRINDING

Whatever type of flat surface grinding your parts may require—be it simple "cleaning up"—or rough grind *and* finish grind in *one* operation—or very flat surfaces with a fine finish and held to close limits—*there is no more profitable method,* in practically all cases, than to "Put it on the Blanchard."

Blanchard's specialization in grinding flat surfaces assures you the most profitable flat surface grinding machines you can buy.

IF YOU MACHINE FLAT SURFACES . . . bring your problems to The Blanchard Machine Company.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

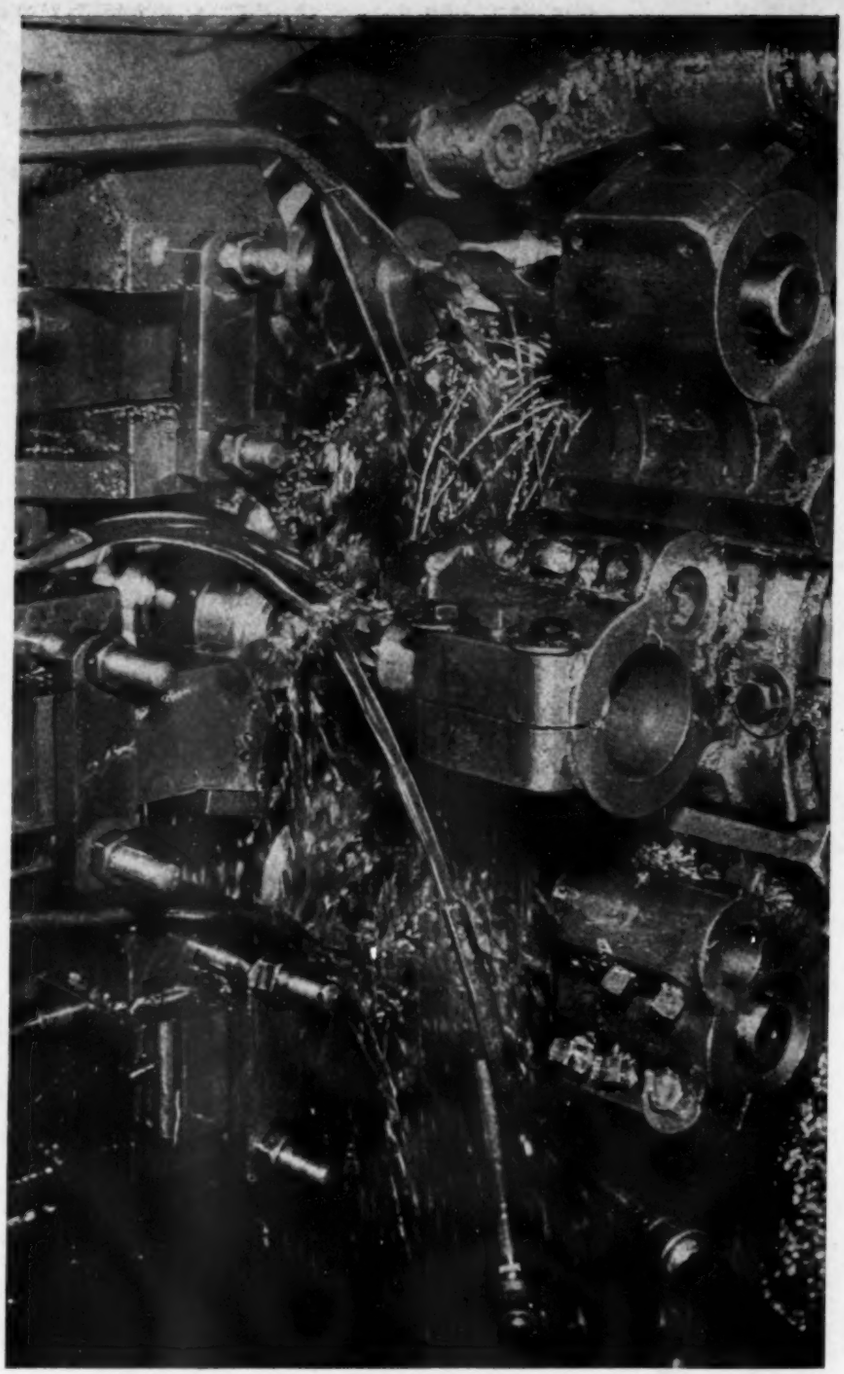
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Inside Knowledge on Metal Cutting Problems

—PRODUCTION—

This is One of a Series of Messages on Common Problems in Your Plant

How to Cut More Units Every 8 Hours!



IN PRODUCTION OPERATIONS (like this Conomatic shown cutting spur-gear blanks for tractor drives) the secret to greater output lies in high speeds maintained without interruption for long periods.

New light-colored, transparent, odorless S/V Sultran Oils are contributing to this objective in many shops.

On this particular operation, for example, speeds of 85 surface feet per minute might be considered as normal. With S/V Sultran, this machine is maintaining speeds 15% over recommended speeds. It is turning out one gear blank every 96 seconds.

With S/V Sultran, there has been no need to shut down the machine during the shift for tool replacement.

The new S/V Sultrans possess high film strength, exceptional oiliness and proper anti-weld qualities to make this possible. These transparent oils also provide greater drainability, lower consumption, and more pleasant working conditions.

SOCONY-VACUUM OIL CO., INC.
and Affiliates: Magnolia Petroleum Company, General Petroleum Corporation

GARGOYLE Lubricants

SOCONY-VACUUM

TUNE IN THE MOBILGAS PROGRAM — MONDAY EVENINGS, 9:30 E.S.T. — NBC

Socony-Vacuum Correct Lubrication

FOR EVERY MACHINE . . . EVERY OPERATING CONDITION

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Ralph C. Coxhead Corp. of New York has a new Vari-Typer that uses 600 styles and sizes of type, plus foreign language, chemical, mathematical and other symbols.

get ready with CONE for tomorrow

Patent 2,409,181 covers a sectional motor truck that can be separated into three pieces and carried anywhere by air.

be ready with CONE for today

Stromberg-Carlson has a new inexpensive adaptor that will enable most owners of pre-war FM sets to receive broadcasts on the new band.

get ready with CONE for tomorrow

Frigidaire, Division of General Motors, is making a plastic lid for its ice cream cabinets that is claimed to be 50% lighter than steel.

be ready with CONE for today

New England Carbide Tool Co. is taking tungsten carbide to the housewife in its new precision knife sharpener.

get ready with CONE for tomorrow

The State of Minnesota will go into business with Continental Machines, Inc. to engage in a continuous chemical process for the extraction of pure iron from slate formerly wasted at the Mesabi iron range.

be ready with CONE for today

The New Holland Machine Co. of New Holland, Pa., will test its new flame cultivator on truck and garden crops in the Rio Grande Valley this winter.

get ready with CONE for tomorrow

Bell System's first experimental rural radio-telephone circuit connects 8 Colorado farms with the Cheyenne Wells central office. Wind driven generators supply power.

The four largest alternating current motors ever built, 65,000 horsepower each, will be made by Westinghouse for Grand Coulee.

be ready with CONE for today

Lockheed's Little Dipper light plane is reported to cruise at 100 m.p.h. and land at 20.

get ready with CONE for tomorrow

A mobile alcohol plant built into a five car train that could travel from farm to farm was demonstrated at the National Chemical Exposition.

be ready with CONE for today

Phthalic anhydricle, one of the most important ingredients in the manufacture of paints, is now being made from petroleum by Oronite Chemical Company.

Climax Molybdenum Corp. is working on two new high temperature alloys. One has 60% chromium, 25% molybdenum and 15% iron. The other has 60% chromium, 15% molybdenum and 25% iron.

get ready with CONE for tomorrow

The Gyro-Glider developed at the General Electric Flight Test Center has a rotor instead of wings and weighs 120 pounds, ready to fly.

be ready with CONE for today

M. W. Kellogg Co. has a new process for separating a considerable number of useful substances from fish and vegetable oils using liquefied propane at high pressure.

get ready with CONE for tomorrow

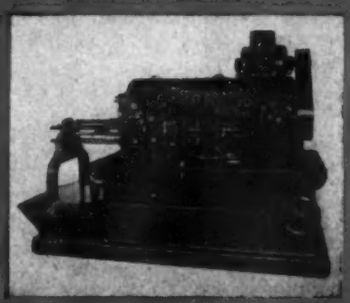
The Texas Company's new cold weather aircraft fuel is claimed to start an engine and to permit switching to regular aircraft gasoline in two minutes, in spite of extremely low temperatures.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

MORE facility is MORE value

The ⅜" 4-Spindle Conomatic, ordinarily assigned to rugged jobs, produced the brass pieces shown in 6 seconds each, including tapping.

Ask your CONE *representative to show you our new color motion picture*



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

38

But there *is* a way, Mister! Kempsmith Standard Attachments actually make it possible for you to convert your standard milling machine into a special purpose miller with all its inherent advantages . . . at the same time reducing production costs to a minimum. Precision-built, and backed by more than 57 years of specialized experience, Kempsmith Attachments, Arbors and Accessories have proven themselves year-in and year-out as dependable tools for almost any type of milling operation. Investigate today. Ask for literature.

Kempsmith Machine Co., Milwaukee 14, Wisconsin, U.S.A.

KEMPSMITH

Attachments and Arbors!

Precision Built Milling Machines Since 1888

One Press for Many Jobs —and PROFIT Every Time

Ability to "earn its keep" in a job shop is a severe test of the versatility of any equipment, and especially so of larger machinery like this 1200-ton double-action Clearing press. Yet this ability to handle a wide variety of work, all on a sharpened-pencil basis, and produce a profit doing it, is often the factor which determines whether a press should be purchased.

The design and construction of Clearing presses merit special attention when consideration is given to varied possible uses. For example, the inner slide of the press shown here has a 42" stroke, long enough for any likely need. Despite this unusual length of stroke, the slide is held parallel to the bed by the exclusive Clearing practice of plunger guiding in the crown in addition to the extra long adjustable gibs. Precise position is therefore maintained at every point of the working stroke regardless of its length.

The precision and the flexibility resulting from Clearing design and craftsmanship are thus further assurance of profitable operations, now and in the future, when you put your press problems up to Clearing. There is no cost, no obligation involved when you consult our engineers.

SPECIFICATIONS

Capacity: Inner slide 700 tons
Outer slide 500 tons
Stroke: Inner slide 42"
Outer slide 36"
Strokes per minute: 4 and 3
Bed Area: 100" x 168"
Die cushion equipment: 138 tons at 100 lbs. air pressure

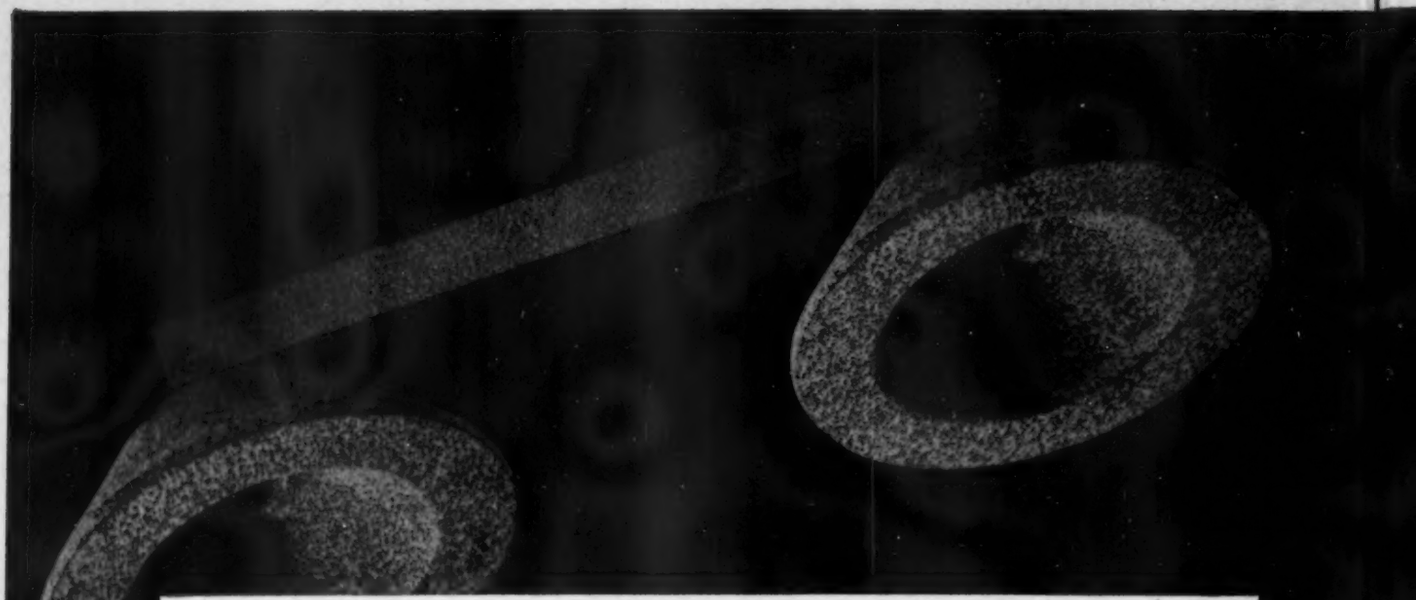
MECHANICAL AND HYDRAULIC PRESSES • 45 TONS CAPACITY AND LARGER

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS



Direct line to lower grinding costs

Are you interested in information that may cut your grinding expenses considerably?

Such information is available through a complete analysis of your grinding operations. This analysis may reveal something you have never suspected —that you are grinding away profits every day.

To remedy the situation, call in Peninsular engineers, specialists in grinding problems since 1889. They will study your grinding from start to finish. From this study, they will give you the answers that plug you in on the direct line to lower grinding costs.

Peninsular engineers have learned that each grinding job has special needs. That's why *every* Peninsular grinding wheel is specially made for its particular job.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Newark, Pittsburgh, Houston, St. Louis, Cincinnati.

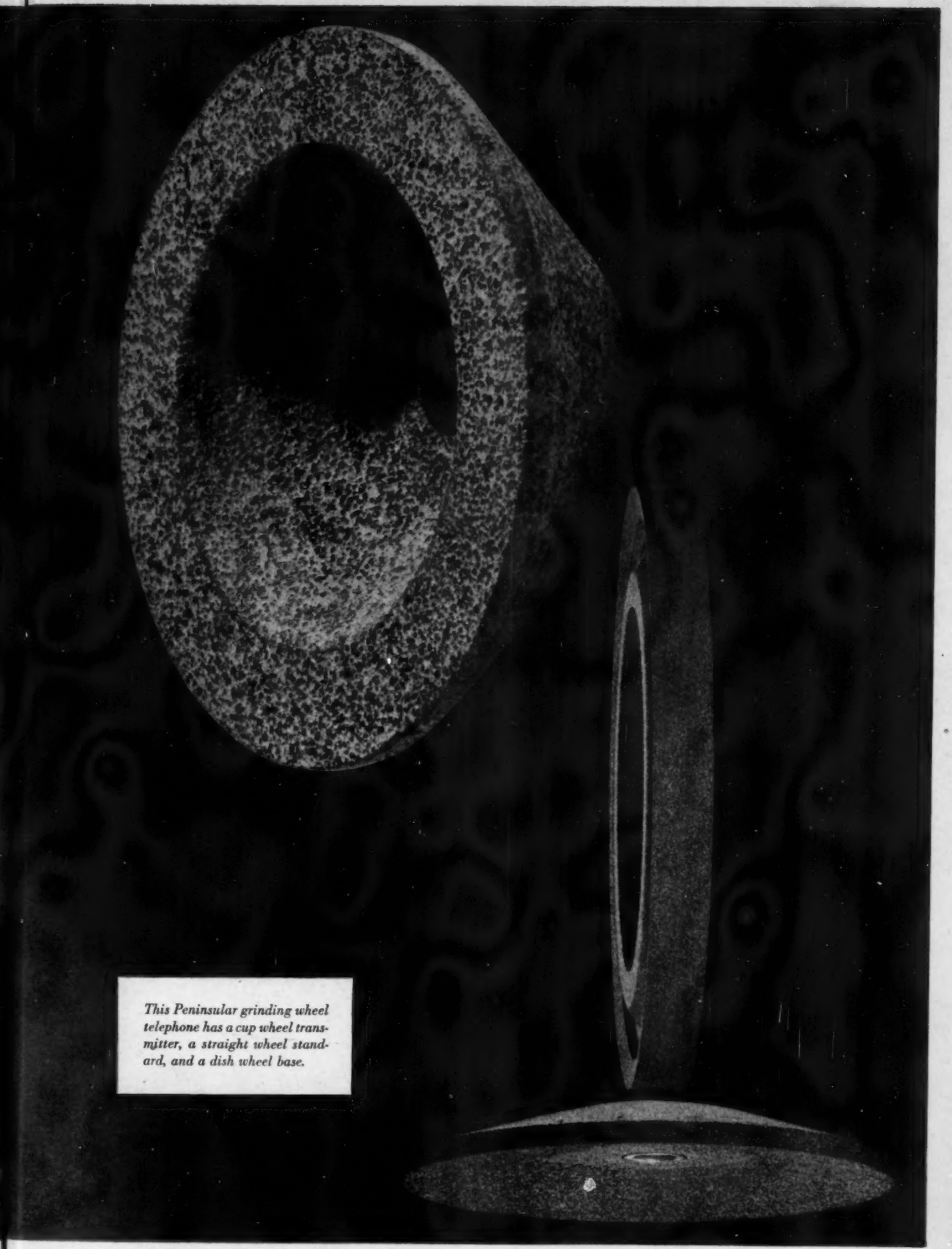
PENINSULAR

INDIVIDUALLY PENINSULAR ENGINEERED

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

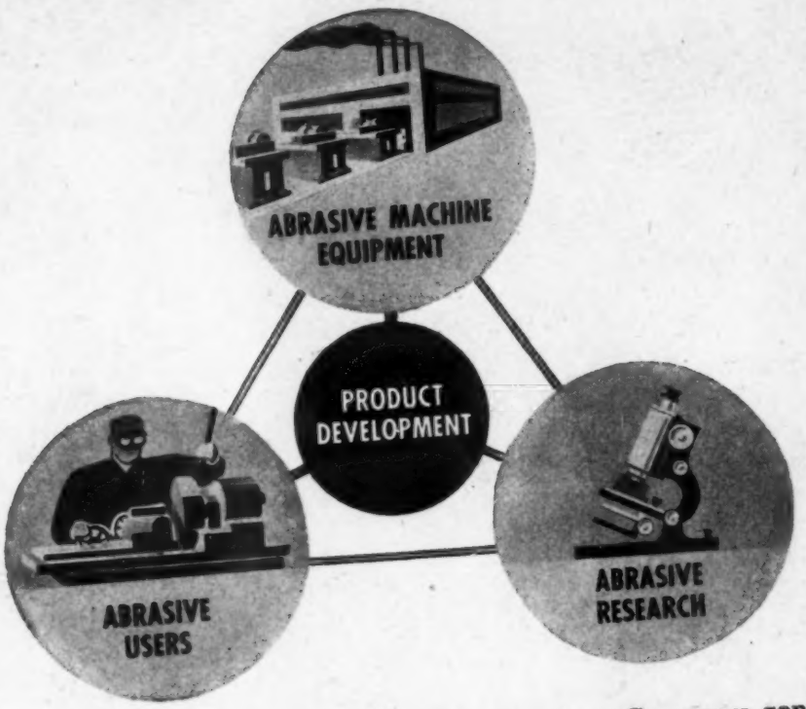


This Peninsular grinding wheel telephone has a cup wheel transmitter, a straight wheel standard, and a dish wheel base.

A BUYING GUIDE FOR ABRASIVES

POINT No. 4

PRODUCT DEVELOPMENT

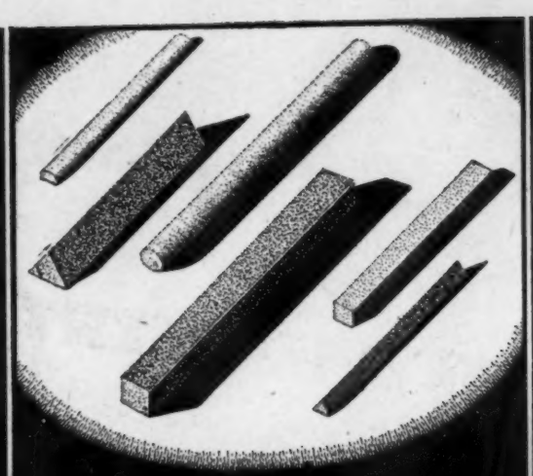


There is an important activity at The Carborundum Company concerned primarily with the interest and viewpoint of abrasive users. It is known as "Product Development."

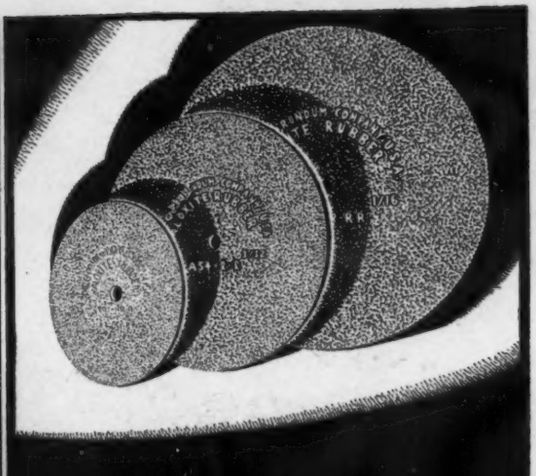
Key step between research and abrasive user, its ten specialized divisions aim toward developing and applying the right abrasive in the right place. It closely relates abrasive machine builders, plant production personnel, and our own research. It evaluates products and techniques. It conducts rigid tests. Vital information is collected and interchanged. Hundreds of suggestions are carefully culled. Selection and application of abrasives thus continue to be made more effective. This is another reason for preferring products by CARBORUNDUM. The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM

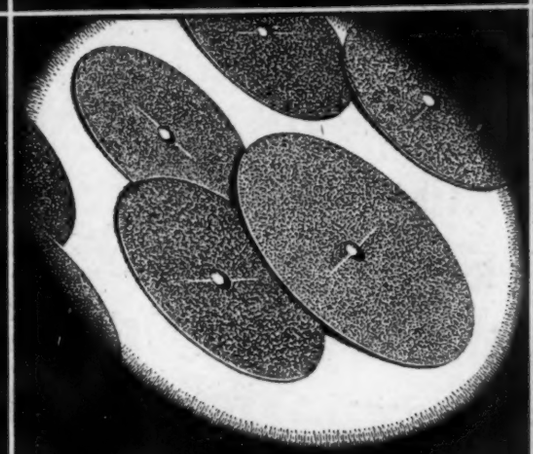
A Good Rule for Good Grindin



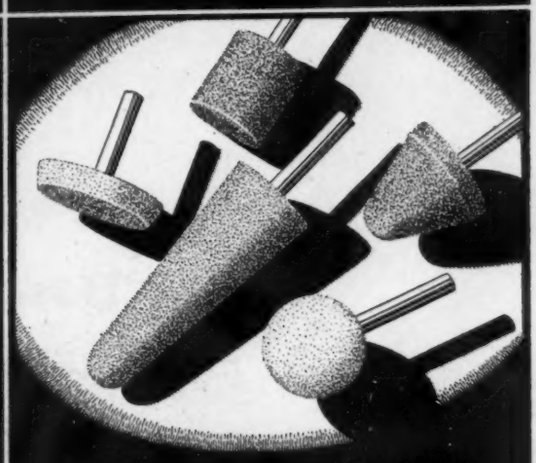
Tool Room sticks and stones that cut fast...last long...and hold their form.



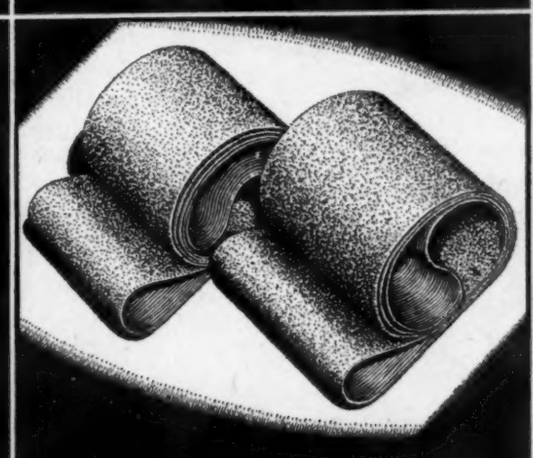
Cutting-Off Wheels . . . the modern tool for faster, less costly, more finished cuts.



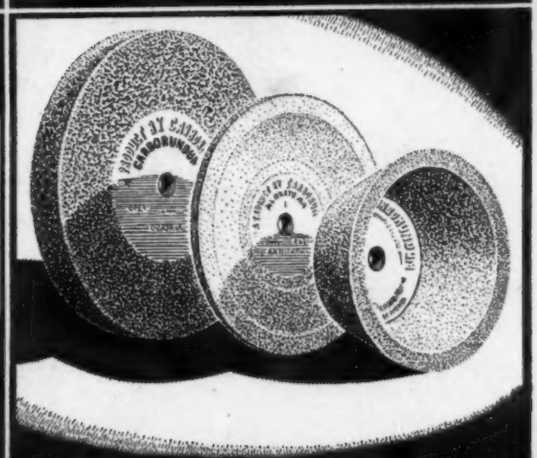
Long lasting Discs for both flat and curved surfaces.



Mounted wheels, in all standard grits and grades, for portable grinding equipment.



A Coated Abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM.

. . . CALL IN **CARBORUNDUM**

TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

The uniformly high quality of ADAMS GEARS is backed by over 64 years manufacturing experience!

SPUR GEARS	RACKS
HELICAL GEARS	LEAD AND FEED SCREWS
BEVEL AND MITER GEARS	GROUND TOOTH GEARS (Spur and Helical)
WORMS AND WORM GEARS	SHAVED TOOTH GEARS (Spur and Helical)
SPROCKETS	GROUND THREAD WORMS
INTERNAL GEARS (Spur and Helical)	
RATCHETS	
SPLINED SHAFTS	

EXPERIENCE is an important factor in the selection of a source of gears. Here at Adams we have had long experience both as a user of gears and as a manufacturer of gears. This experience is backed up by skilled workmen and the most modern gear producing equipment. Take advantage of these facilities the next time you need gears. THE ADAMS COMPANY, 1942 Bridge Street, Dubuque, Iowa.

the ADAMS compa

Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883

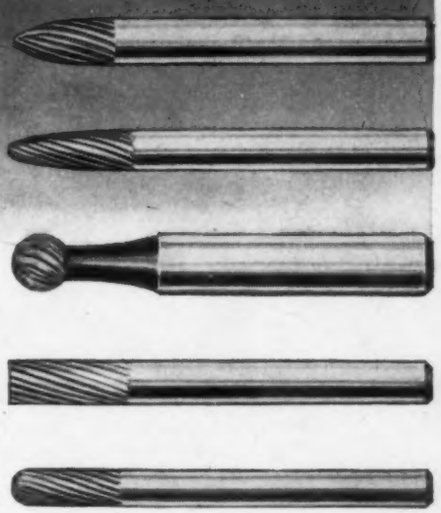
New P&W COST-CUTTERS

A Get-Acquainted Kit of Master-Ground Carbide Burs

Here's a neatly packaged kit of P&W Master-Ground Carbide Burs that will earn its keep in almost any shop. And in your shop, it will demonstrate many important ways to cut costs and save time. Here's why:

1. They're uniform. Every one is the identical twin of every other of a designated shape. All teeth share equally in the cutting so they wear uniformly, maintaining their shape.
2. They outlast ordinary high-speed steel burs up to 75 times before re-sharpening. Then, they may be re-sharpened many times at Pratt & Whitney.
3. They'll do many jobs that ordinary burs can't . . . such as altering dies or molds *after* hardening . . . even to 65 Rockwell C.

Get acquainted with P&W Carbide Burs. Place your order for this valuable set, today.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

KELLEREFLEX SALES DEPARTMENT

WEST HARTFORD 1, CONN.

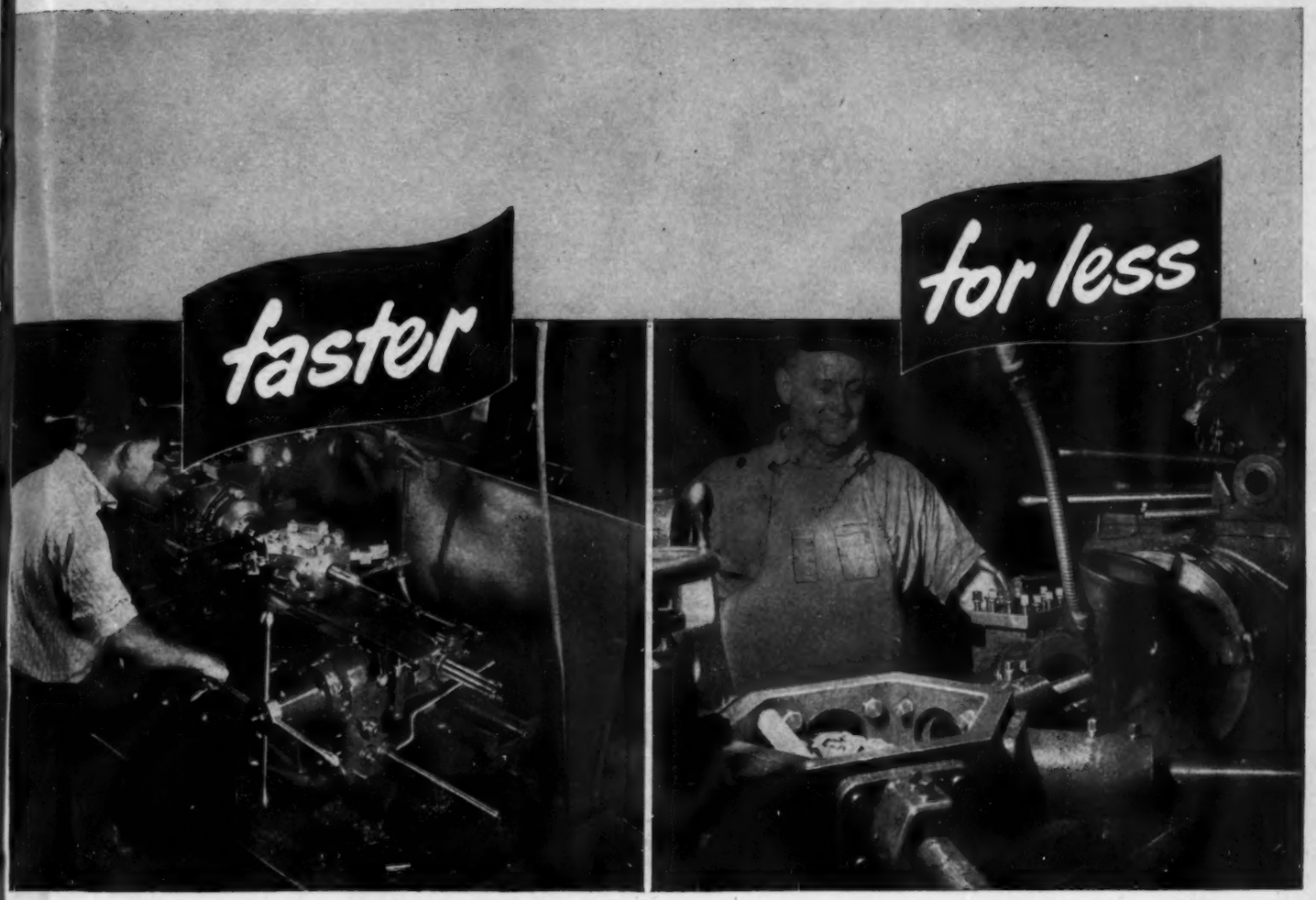
You can machine it...

better

The Govro-Nelson Company, Detroit, found that fine quality aircraft parts could be produced better on Warner & Swasey Turret Lathes. The power and rigidity of Warner & Swaseys were needed to turn crankshafts from 2512 steel to tolerances of .0005"—to cut threads at hardness of 35 Rockwell C.

...with a

TURRET LATHES. MULTIPLE SPINDLE AUTOMATICS.



In the shops of International Business Machine Corp., Endicott, N. Y., only two new high-speed Warner & Swasey Turret Lathes were needed to replace three old machines. And yet these new Warner & Swaseys proved to be such fast producers that they required only 51 hours per lot as against the old time of 70 hours —a saving of 19 hours per lot!

Take the case of this Warner & Swasey 4-A Turret Lathe, with a service life of 25 years at the Steel Products Engineering Company, Springfield, Ohio. For 14 years it operated on two continuous 10-hour shifts—equivalent to 25 years' normal service. Yet until this Warner & Swasey was returned to us for inspection and rebuilding, the headstock cover had never been removed.

Warner & Swasey

An important function of our business is to help *you* "machine it better, faster for less"

Sometimes it can be done by the simple addition of new accessories to your present machine tools or by suggesting new tooling setups and operational methods. Or perhaps new Warner & Swasey Turret Lathes or Multiple Spindle Automatics may prove a profitable investment for more efficient production.

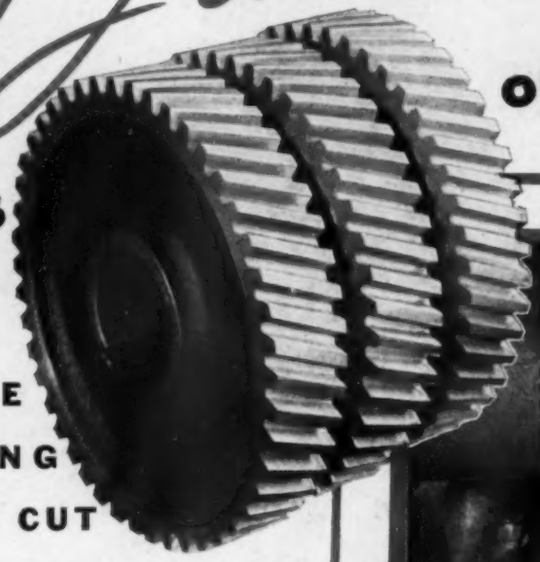
At your request, a Warner & Swasey field engineer will call, without obligation, to discuss your needs.

WARNER & SWASEY
Machine Tools
Cleveland

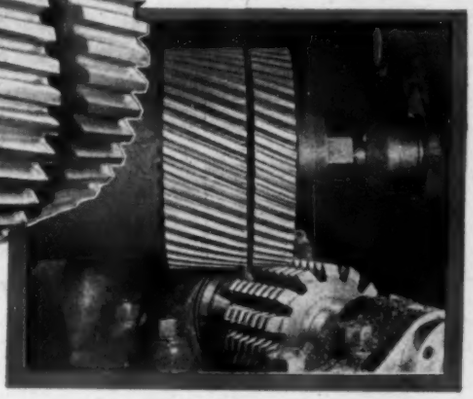
PRECISION TAPPING AND THREADING MACHINES

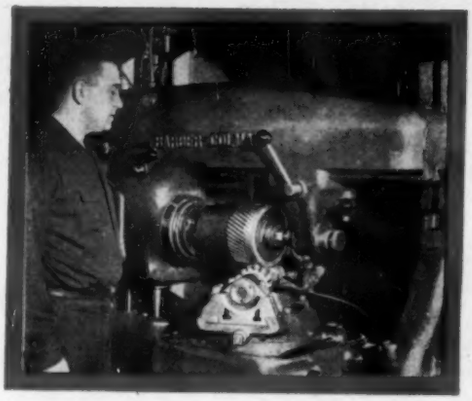
No Question!

ABOUT RESULTS ON THIS JOB!



TYPE D MACHINE REDUCES HOBBING OPERATION TO ONE CUT





Automatic cycling and easy set-up resulted in higher output . . . lower operating costs on this gear hobbing operation. A Barber-Colman Type D Hobbing Machine doubled the output of gears by reducing the operation to one cut, and produced a cost saving of more than 50% per gear. Here are the facts in the case:

Under the former production method, these helical drive gears were rough hobbed, and then semi-finished, holding limits within .0005″ on lead. Considerable time was needed to realign the machine in exact position for the second cut.

The job was transferred to a Type D Hobbing Machine, having standard automatic cycle, hydraulic operation, differential drive, and climb hobbing feature. The rigidity and power of this machine made it possible to complete the gears in *one cut*. Its accuracy in heavy cuts produced repeated precision, and eliminated individual gear checking.

Automatic cycling simplified and speeded up the operation. Easy set-up through central controls provided quick selection of feed rates. Climb hobbing was arranged simply by changing the control on the panel. Actual production time was 7 minutes per gear, hobbing 3 blanks per load.

Results like these warrant investigation of the Type D Machine for your gear cutting operations. Why not write today for a cost estimate proposal on your requirements? Send part prints to Barber-Colman Hobbing Service.

GET—A copy of new Type D Hobbing Machine bulletin describing field applications and extra equipment. Ask for bulletin F-1477.

WAR ASSETS MACHINES — Consult Barber-Colman Hobbing Service on B-C Machines. While we cannot guarantee condition of these machines, we gladly offer recommendations regarding their application to your work.

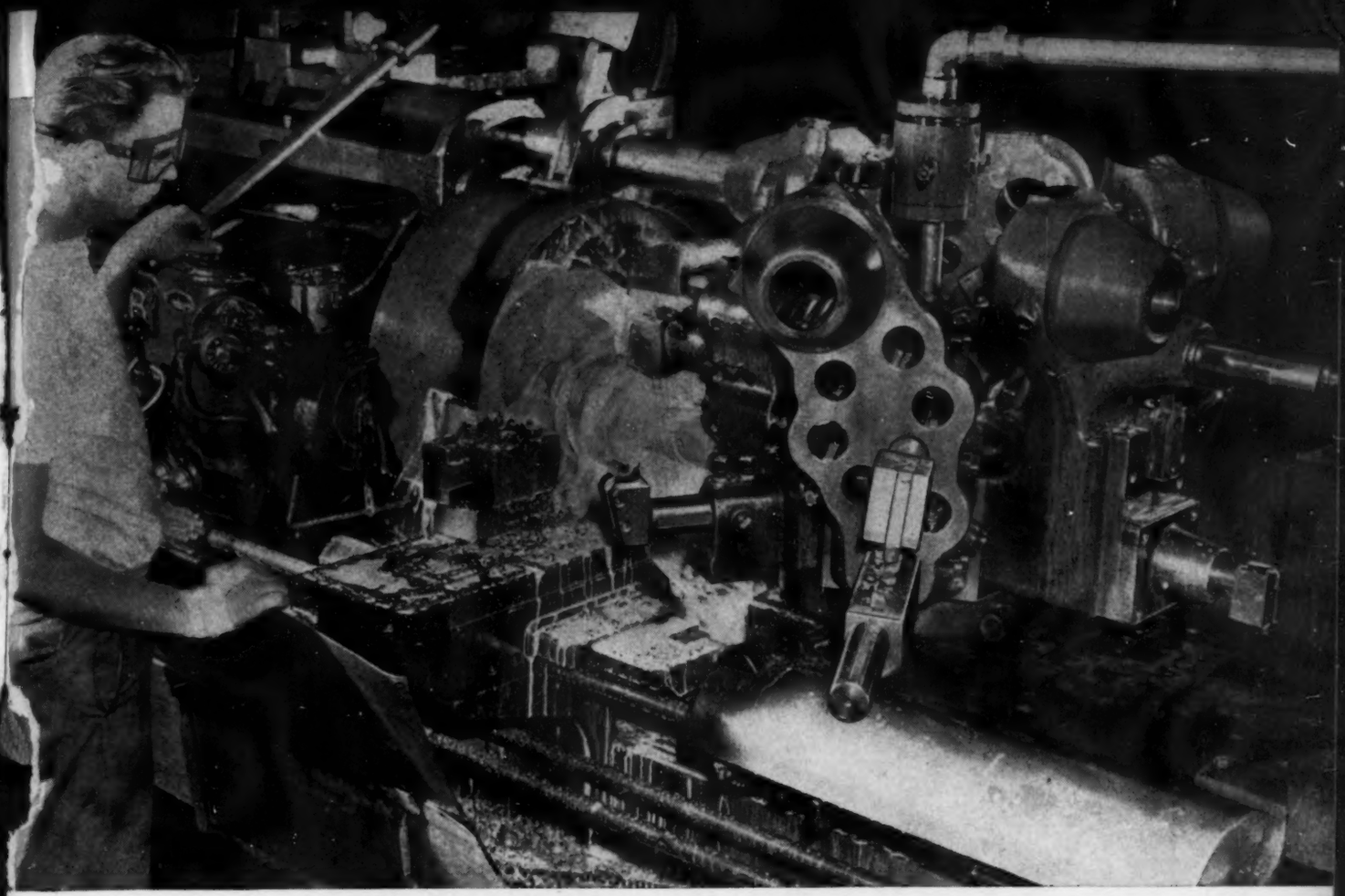
QUICK FACTS...

Part — Countershaft Drive Gear, 46 teeth, 6.539 DP, 23°25′ R.H. helix angle, 7.738″ O.D., 1-3/8″ face.
Material — SAE 4620 Forging, 187-156 Brinell.
Feed — .065″ per rev. of work. Speed — 103 RPM.
Cutting Time — 7 min. per gear.
Hob — 5″ x 4″ x 1-1/2″, double thread, ground.
Hob Life — 108 pieces per sharpening.

ACCURACY-RIGIDITY-POWER BARBER B-C COLMAN FOR HI-PRODUCTION HOBBING

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.



How this FASTERMATIC combined two jobs in one chucking!

Here, on a clutch sleeve, the Fastermatic eliminated an extra chucking and machining operation by the simple addition of a standard automatic recess boring attachment. The work, which previously required two machines and two operators, is now done complete in *one* Fastermatic operation. More concentric diameters are produced through a *single* chucking—and production is increased.

In case after case, the versatility of the Fastermatic together with the tooling "know-how" of Gisholt engineers have made it possible to handle more work with standard tools and attachments, and do it on a cost-cutting basis.

Why not see for yourself what Gisholt's combination of EXPERIENCE and the RIGHT MACHINE can do for you?

GISHOLT MACHINE COMPANY

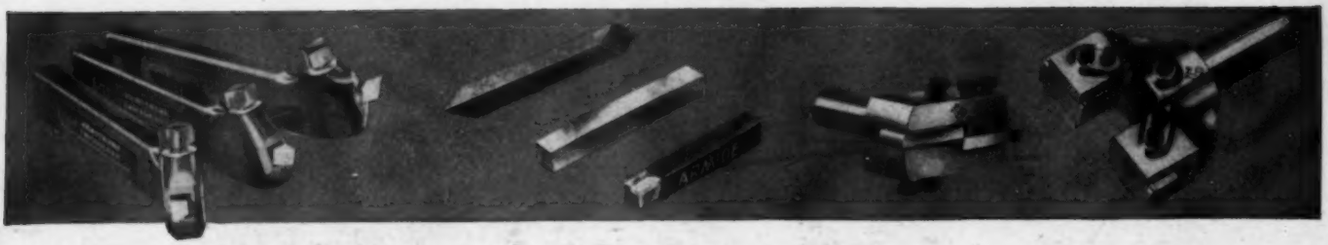
1245 East Washington Avenue MADISON 3, WISCONSIN

THE GISHOLT ROUND TABLE *represents the collective experience of leading specialists to help you solve your problems in the machining, surface finishing and balancing of round and semi-round parts. Ask Gisholt for help on your problems.*

TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

ARMSTRONG

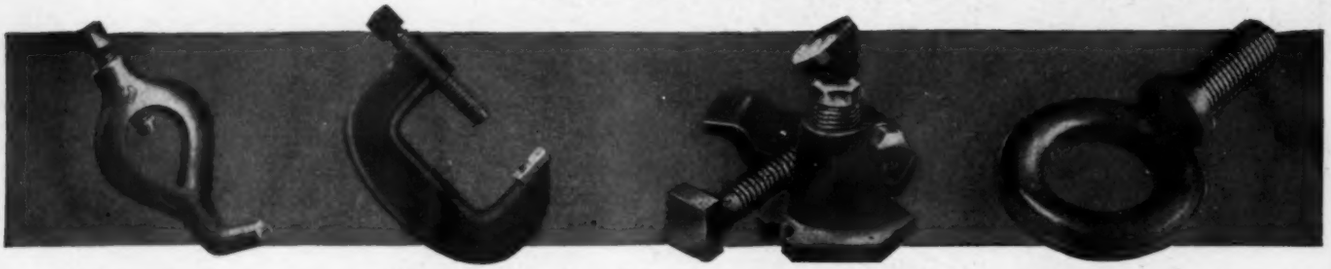
Quality TOOLS



ARMSTRONG TOOL HOLDERS
Permanent, multi-purpose tools, for every operation on Lathes, Planers, Slotters and Shapers.

ARMSTRONG HIGH SPEED
Ready-to-grind Bits...Ground Cutters.
ARMALOY Cast Alloy CUTTER-BITS
ARMIDE Carbide-Tipped CUTTERS
6 cutter shapes, 12 sizes—2 grades.

ARMSTRONG Turret Lathe and Screw Machine TOOL HOLDERS
Drill Holders, Cutter Holders, Finishing and Knurling Tools for standard operations.



ARMSTRONG Drop Forged DOGS
Lathe Dogs, Milling Machine Dogs, and Clamp Dogs. 12 types, all sizes.

ARMSTRONG Drop Forged "C" CLAMPS
Heavy Duty, Medium Service, Deep Throat, and Tool Makers' types in all sizes. Also Machinists' Clamps.

ARMSTRONG Setting Up Tools
A complete line of Drop Forged Strap Clamps, Planer and Bracing Jacks and T-slot Bolts.

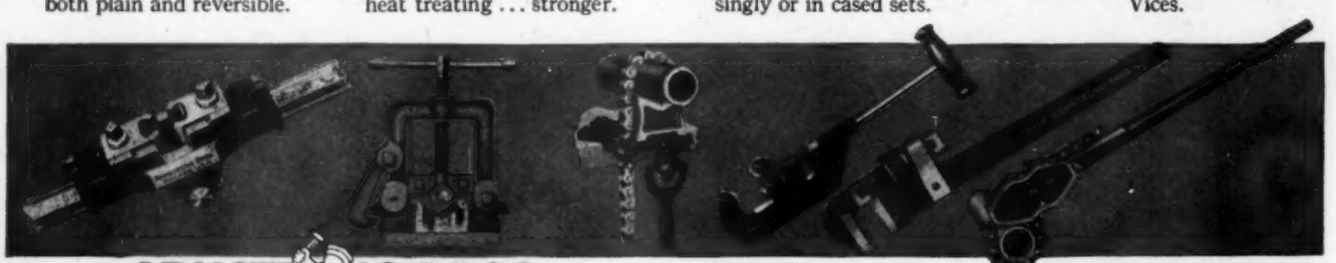
ARMSTRONG Drop Forged Eye Bolts
Plain or shoulder pattern. Blank or Threaded. 14 sizes, Drop Forged and heat treated.

ARMSTRONG Ratchet Drills
All steel wearing parts hardened. Packer, Railroad, Standard, and Short types, both plain and reversible.

ARMSTRONG Drop Forged Wrenches
Both Carbon and Alloy Steel. Over 100 types in all sizes. Improved designs, steels, and heat treating ... stronger.

ARMSTRONG Detachable Socket Wrenches
All sizes and types with driving handles, extensions, and drop forged ratchets. Sold singly or in cased sets.

ARMSTRONG Machine Shop Specialties
Drill Drifts, Tool Posts, Drill Holders, Cutter Grinding Holders, and Tool Makers' Vices.



ARMSTRONG BROS.

Better Pipe Tools. A complete line, each a better **tool** with hardened, alloy or drop forged parts **where**ver they will add to strength or tool life.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
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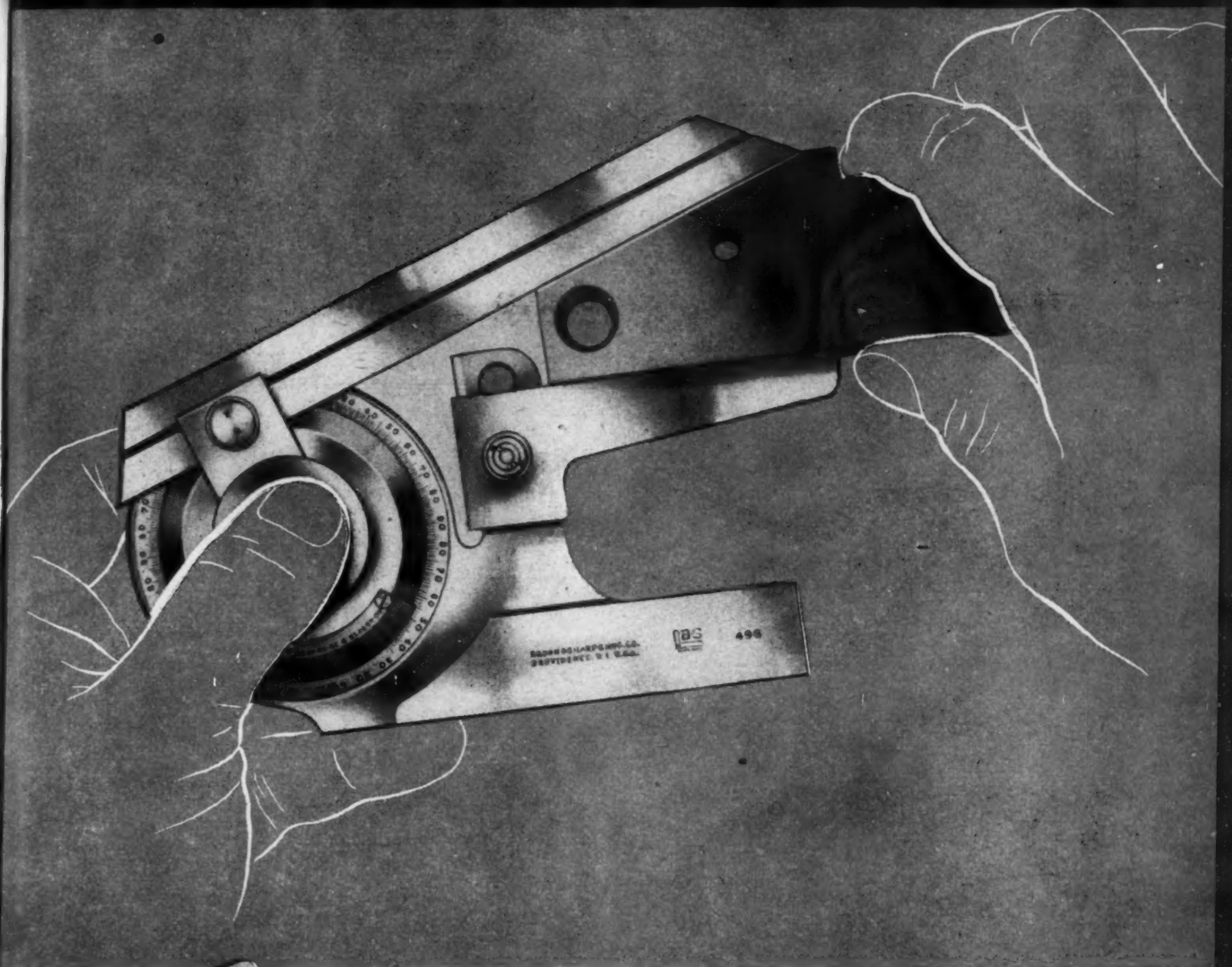
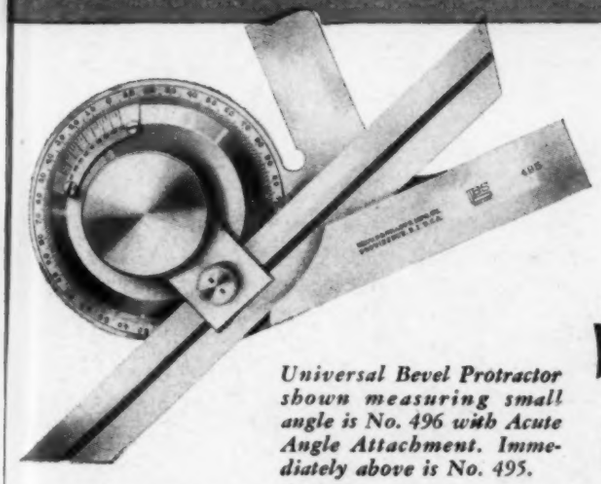
Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.

TOOLS THAT EARN THE TRUST

of skilled machinists





Universal Bevel Protractor shown measuring small angle is No. 496 with Acute Angle Attachment. Immediately above is No. 495.

We urge buying through the Distributor

WHEN A MACHINIST lays out or establishes an angle with a Brown & Sharpe Bevel Protractor he has complete trust in the accuracy of a fine tool. That trust, whether inherited from an older craftsman, acquired from everyday use or even from apprenticeship days, has been earned by the superior performance of Brown & Sharpe Tools—by excellence of design and workmanship. This trust is an intangible quality that adds a very tangible extra value to the tools themselves—that makes each purchase of Brown & Sharpe Tools a satisfying, wise investment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Save time . . . prevent damage to motor and shaft . . . with TEXROPE

"MAGIC-GRIP" SHEAVES

QUICKLY ALIGNED

Because it slides freely on the shaft, it's easy to line up the sheave accurately — for good alignment, smooth operating, longer belt life. It pays to standardize on "Magic-Grip" sheaves.

See Sweet's Catalog

SLIPS ON EASILY

Comes completely assembled. Tapered split bushing provides clearance for even over-size shafts — it's compressed and locked to the shaft with an all-around clamp grip by tightening three cap screws. Can be removed as easily as it goes on.

HERE'S A SHEAVE that goes on *fast*. Less labor cost — less downtime. But that's only part of the saving. There's no forcing or hammering to damage motor bearings — no set screws to mar the shaft. Locks on with a powerful clamp grip that prevents backlash or wobble. And . . . it costs no more than a standard heavy duty sheave of comparable materials and precision workmanship.

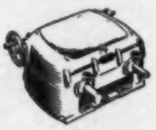
Texrope "Magic-Grip" sheaves are made in diameters from 5.4 to 48 inches, two to 12 grooves. They're engineered by Allis-Chalmers, originators of the multiple V-belt drive. For specifications, prices, call your nearest A-C dealer or office. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2221

TEXROPE .. Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

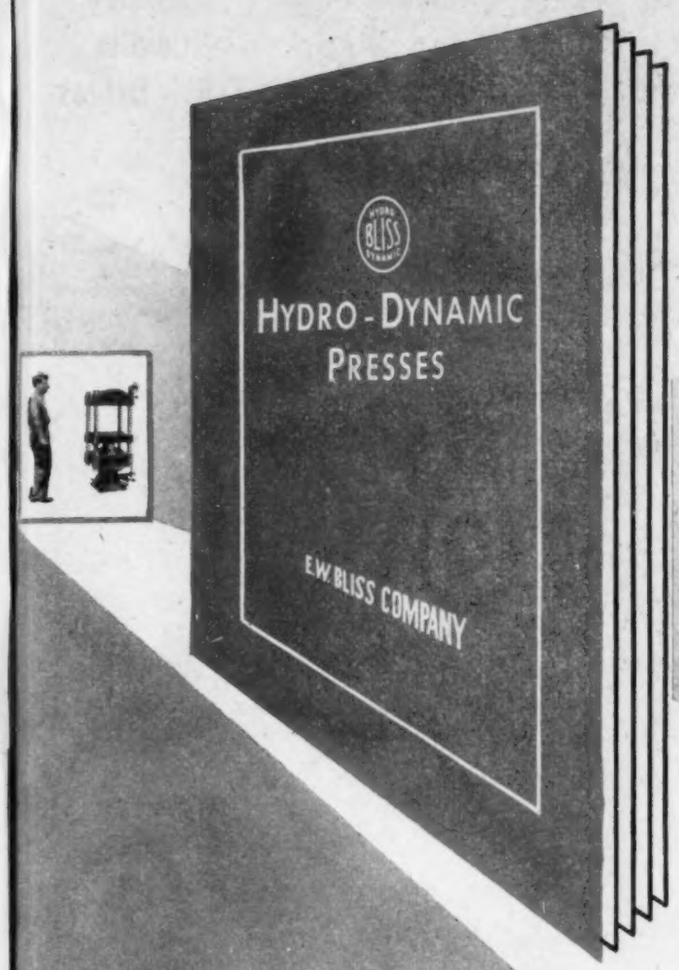
TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

ALLIS·CHALMERS

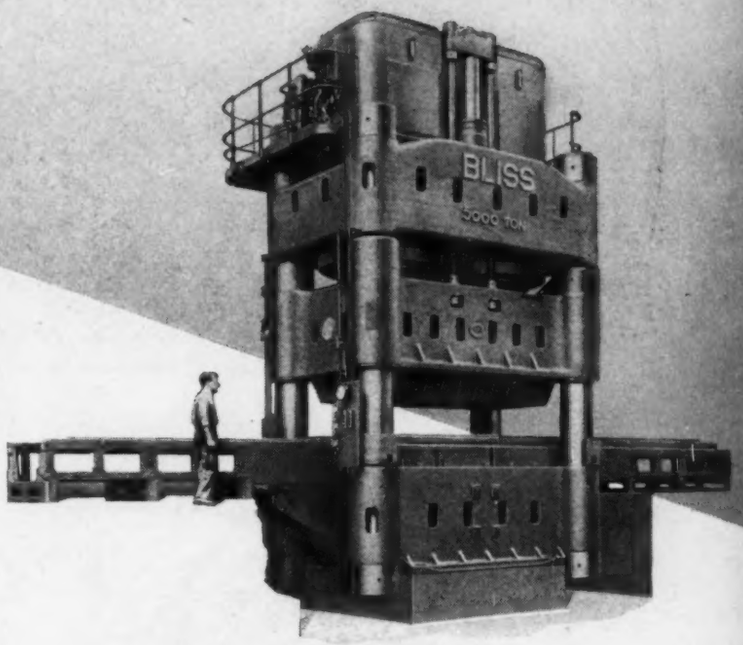
One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

HOW TO PICK THE HYDRAULIC PRESS FOR THE JOB... *and Why*



DESCRIBED IN THIS TIMELY BLISS BOOK *Free*



If you are engaged in cold forging or deep draw work, powdered metallurgy or hot forming–

If you are undecided as to the cost-saving and production advantages of hydraulic presses for *your* jobs–

Then you will find this new and timely Bliss book "HYDRO-DYNAMIC PRESSES" of real value in *selecting the right press for the job.*

For this book illustrates and discusses many applications of hydraulic presses, including new developments resulting from war production requirements. It also describes the Bliss line of hydraulic presses from 50-ton to 5,000-ton equipment, single-action and double-action–the most complete selection available.

You'll find down-to-earth, factual information in this 64-page, illustrated study covering the broad advances in hydraulic press construction achieved during recent years of high-speed production.

Since Bliss manufactures both hydraulic and mechanical presses, it can render an unbiased decision and make recommendations as to the type of press to use solely on its engineering merits.

"HYDRO-DYNAMIC PRESSES" covers housing type presses, open rod presses, material handling, special-function presses, die cushions and double-action presses–all accompanied by applications and engineering data.

Everyone who has seen it agrees that this book "is a must". You will, too. Write for it on your letterhead.

STAY AHEAD WITH *Bliss*

E. W. BLISS COMPANY 450 AMSTERDAM AVENUE, DETROIT 2, MICHIGAN

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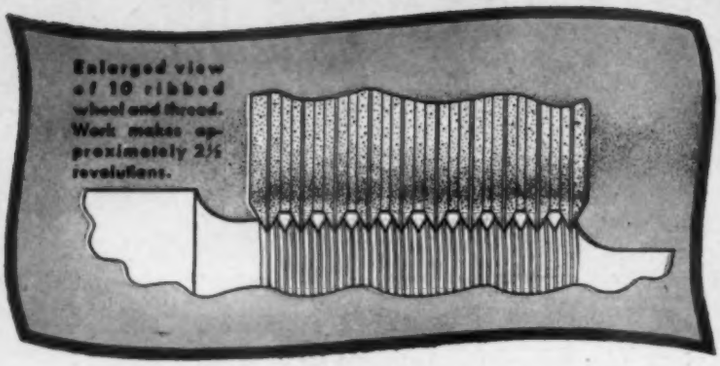
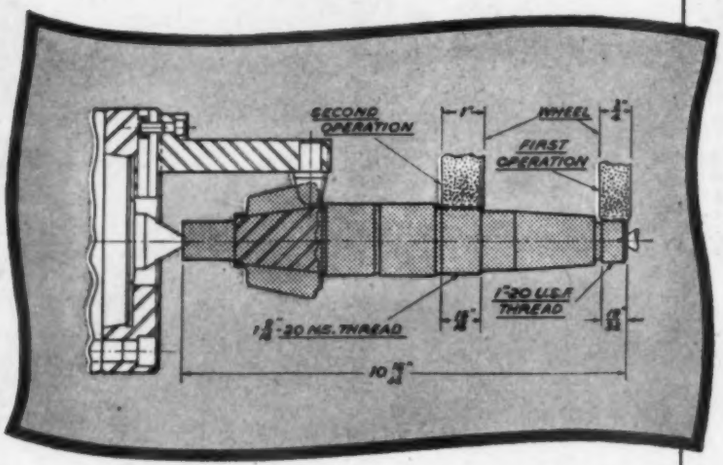
MECHANICAL AND HYDRAULIC PRESSES • AUTOMATIC FEEDS • DIE CUSHIONS • ROLLING MILL EQUIPMENT • CAN AND DRUM MAKING MACHINERY



HERE'S *Production* THREAD GRINDING . . .

Ground from the Solid in *15 seconds*

1"—20 N.S. THREAD, GROUND FROM THE SOLID



ON AXLE DRIVE PINIONS

"PRODUCES NEAR PERFECT THREAD"

"EXPENSIVE HAND DIE OPERATIONS ELIMINATED"

"NO MARRED THREADS ON THE ASSEMBLY LINE"

"WHEEL COST PER PIECE LESS THAN THREAD HOB AND CHASER COST"

The Timken Detroit Axle Company, prominent manufacturer of heavy truck axles, has this to say about a Jones & Lamson Automatic Multi-Ribbed Thread Grinder installed to grind the threads on axle drive pinions.

"The threads are machined as a last operation following heat treat and grinding of all bearing diameters and prior to lapping. The machine produces a near perfect thread and eliminates all expensive hand die operations along the line and overcomes marred thread on the assembly line".

". . . the grinding of threads also reduces direct labor costs and indirect cost of cutting tools and equipment".

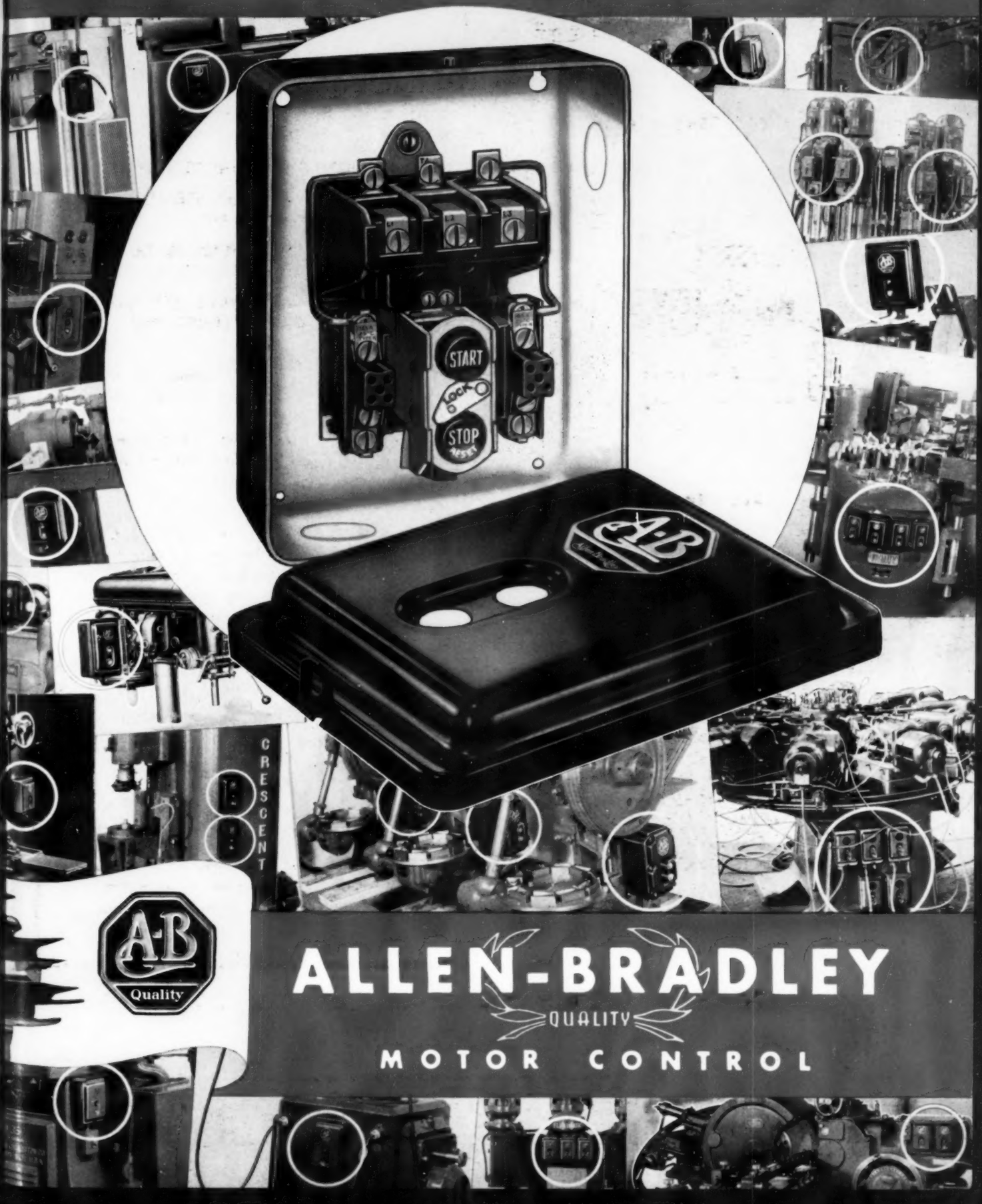
Jones & Lamson Automatic Multi-Ribbed Thread Grinders offer remarkable opportunities for economy with better quality in the mass production of threaded parts. Ask for one of our engineers to tell you more about multi-ribbed production thread grinding.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Automatic Thread Grinders* and Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

Bulletin 609

THE MOST POPULAR HAND OPERATED STARTER ON THE MARKET



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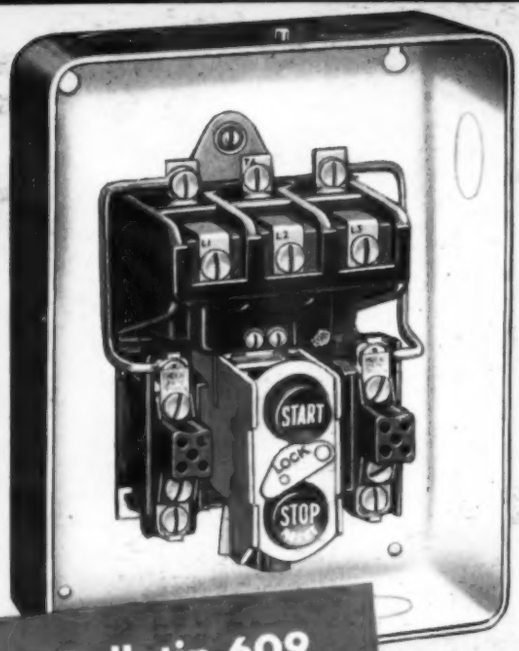
MOTOR CONTROL

BOTH GOOD FOR *MILLIONS*

OF TROUBLE-FREE OPERATIONS



Bulletin 609 HAND-OPERATED MOTOR STARTER

DOUBLE BREAK SILVER ALLOY CONTACTS Any oxides that may form on these contacts are good electrical conductors. That's why cleaning, dressing, filing, or contact maintenance of any sort is unnecessary.

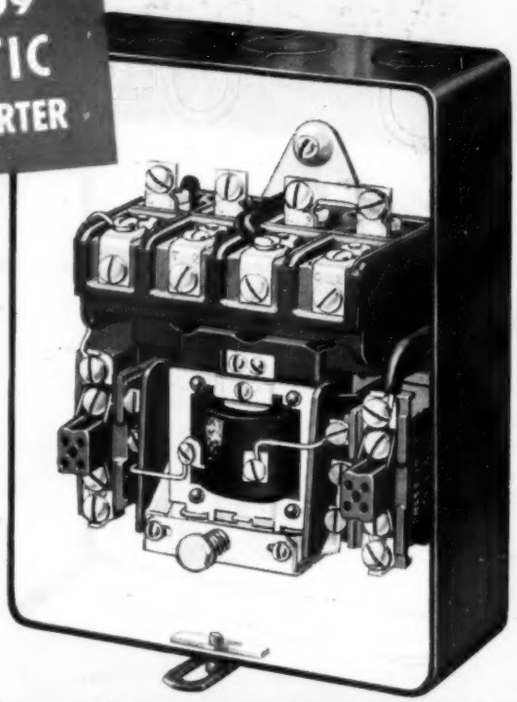
QUICK MAKE AND QUICK BREAK CONTACT ACTION The simple cam and roller switch mechanism opens and closes the contacts with a snap action. The contacts cannot be "teased." This prevents welding of the contacts and assures long contact life.

MOTOR OVERLOAD PROTECTION Two thermal breakers open the main switch contacts and protect the motor in case of sustained overloads. After they trip, pressing the "stop" button resets the overload breakers.

WHITE INTERIORS White enameled cabinet interior reflects light and illuminates the starter in dark places, making installation easy.

Bulletin 609 hand operated motor starter is the modern starter for small a-c line start motors. This ruggedly built unit will give years of trouble free operation. Push button operated. Although it is the smallest starter on the market for its rating, it has generous space for wiring.

Bulletin 709 AUTOMATIC SOLENOID STARTER



NO CONTACT MAINTENANCE The straight line motion prevents contact rebound and practically eliminates contact welding. The double break silver alloy contacts never have to be cleaned or dressed.

EFFICIENT SOLENOID MECHANISM The solenoid magnet will operate at line voltages far below normal, assuring positive contact pressure at all times and preventing motor shutdowns when voltage regulation is bad.

ONLY ONE MOVING PART The only moving part is the solenoid plunger which operates practically without friction. There are no pins, pivots, hinges, or bearings to gum up or corrode and cause trouble.

GENEROUS SPACE FOR WIRING The compact solenoid switch mechanism, white cabinet interior, numerous knockouts, accessible terminal connections, and removable cabinet cover combine to make installation easy.

Here's the most widely imitated starter on the market—the unit that revolutionized modern motor control design and proved its superiority under the toughest service conditions. Write for complete information, Allen-Bradley Company, 1316 S. Second St., Milwaukee 4, Wisconsin.

A-B Quality

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Attaches to
***a* LATHE**
JIG BORER
MILLING MACHINE
DRILL PRESS
INTERNAL GRINDER
***or* SURFACE GRINDER**
and makes it a
PRECISION *grinder*

Low cost precision grinding at 65,000 R.P.M.

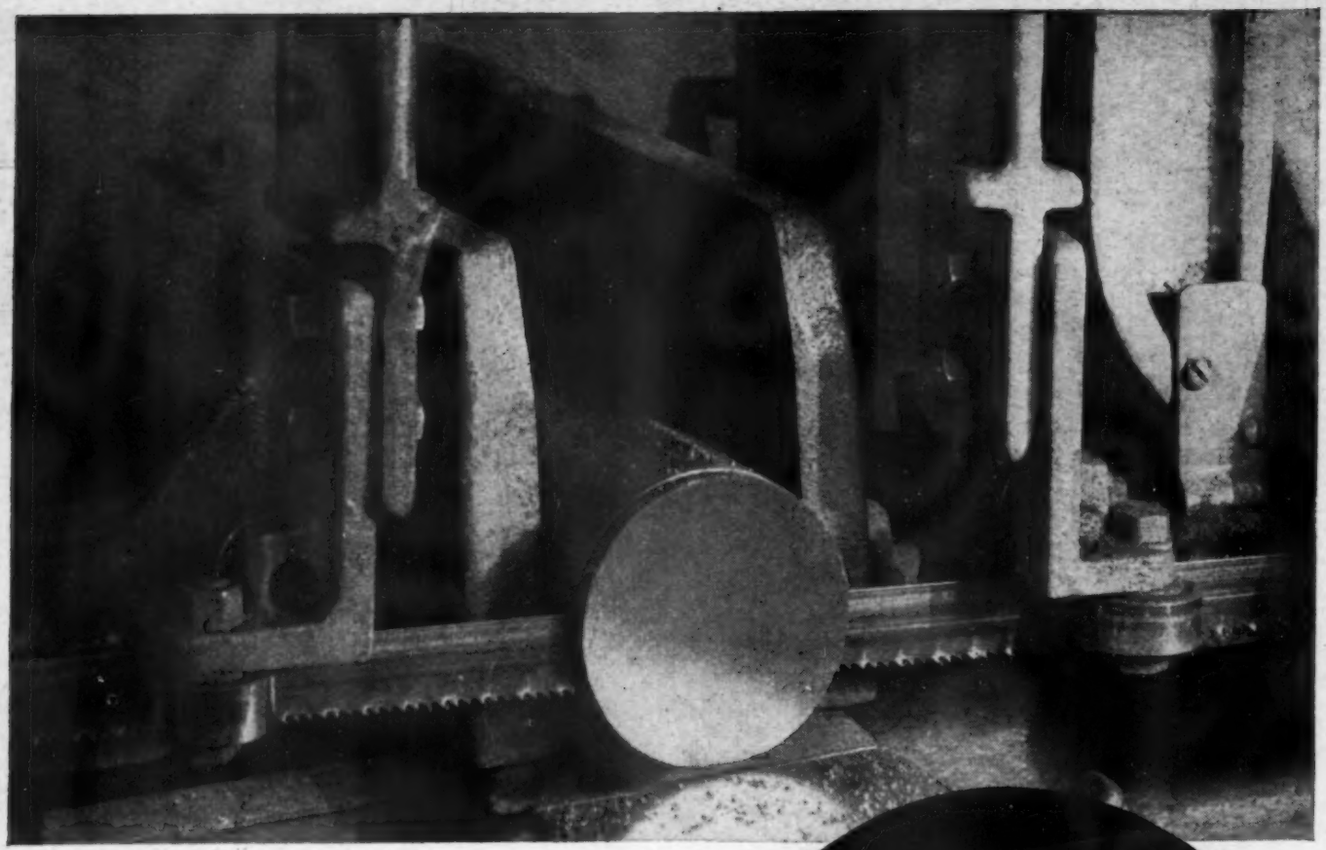
The VULCANAIRE is an air driven high speed precision grinding instrument equipped with special adapters to fit the spindle of a machine tool. It can be *put on* or *taken off* of a machine tool as easily as a boring chuck. The VULCANAIRE, for example, can transform a jig borer into a high speed precision grinder—then it can accurately locate and finish grind hardened holes between 1/16" to 1 1/2" diameter *to "tenths"* with required speeds for small grinding wheels (30,000 to 65,000 RPM).

Please let us know the name and type of machine tool on which you would like to use the VULCANAIRE system and we will quote price and delivery.

- ***Does the Vulcanaire run constantly cool—never more than a few degrees above airline temperature? — YES***
- ***Is a vacuum unit furnished which collects all grinding and tool dressing dust? — YES***
- ***Does the Vulcanaire system include adapter for the machine we will use it on? — YES***
- ***Is a standard air filter and oiler, pressure gauge, and speed regulator included? — YES***

Vulcanaire

A PRODUCT OF VULCAN TOOL CO.
730 LORAIN AVE., DAYTON 10, OHIO



Climb on the SIMONDS "BAND-SAW WAGON"

Save Thousands of Hours by Band-Saw Cutting . . . instead of Shaping, Milling, Turning, Drilling

Getting to be a "Big Parade" . . . the way shops are swinging to metal band-sawing . . . and keeping their one-purpose machines free to do the work for which they were designed.

Simonds Metal-Cutting Band Saws can do a score of jobs, and do them all at top speed and accuracy . . . cut-off work, contour cutting, and cutting of irregular shapes like jigs, dies, fixtures, as well as heavy straight production cuts . . . and many other similar jobs.

And Simonds Metal Bands earn top profits on these jobs because they're made to *stay* on the job many hours longer . . . running smoothly, easily, cleanly. Simonds special steel, perfect tooth-milling and even tooth-set . . . those are the Simonds *extras* that *pay you extra* on every Simonds Metal Band you buy. Order from your distributor today.

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SAW AND STEEL CO.
FITCHBURG, MASS.
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Dangerous?

....what about your cutting fluid?

YOU'RE taking chances every hour of the day if you use old-fashioned cutting fluids. But *not* if you use Cimcool. For this new and different cutting fluid—this *chemical emulsion*—actually helps prevent accidents four ways:

1. Fire hazards are eliminated because Cimcool can't burn. **2.** It forms no slippery film on hands, machine or floor. **3.** It restricts bacterial growth and thus limits risk of dermatitis. **4.** Because it cools faster through a unique *physical change* in the coolant itself, Cimcool eliminates hot tools and chips—actually keeps them cool to the touch.

Get the whole Cimcool Story

- Faster cooling allows faster cutting.
- Uniform work temperature increases accuracy.
- No chromates or other skin irritants.
- Contains long-lasting rust inhibitor.
- Chemical lubricity increases tool life.
- Covers 85% of all metal working jobs.

CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

Trade Mark Reg. U. S. Pat. Off.

CIMCOOL DIVISION of THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

why make mountains out of molecules?

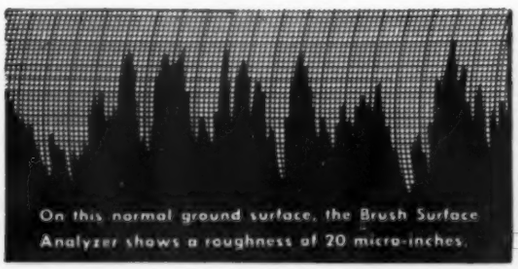
Because that's the way to learn about wear! Take a profile of a "smooth" ground surface, blow it up till millionths look like mountains—and then you see what happens to bearing surfaces.

Above is the profile recording of a normal ground surface as shown by the Brush Surface Analyzer. Those sharp ups and downs are actually the invisible grinder scratches and chatter marks that rupture oil film, opening the way to scoring and burning.

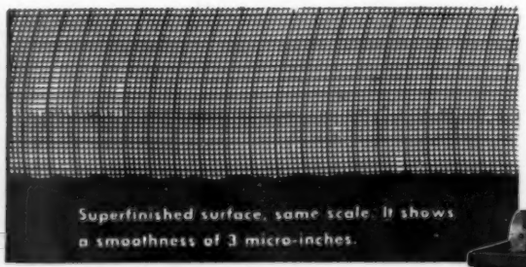
At right, below, is the Brush analysis of a *Superfinished* surface, which is seven times as smooth as the one at left. With a surface such as this, a bearing will last indefinitely.

Superfinishing is a quick, simple, inexpensive process. Not only does it pay for itself through the better service it assures, but Superfinishing can often replace other, more costly processes. Full information available on request.

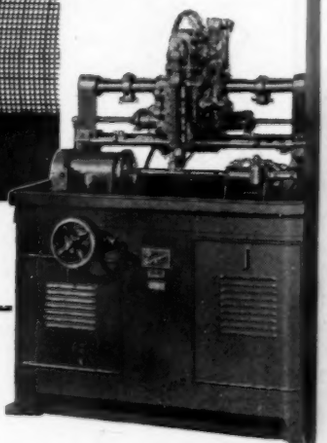
GISHOLT MACHINE COMPANY *1245 East Washington St. • Madison 3, Wisconsin*



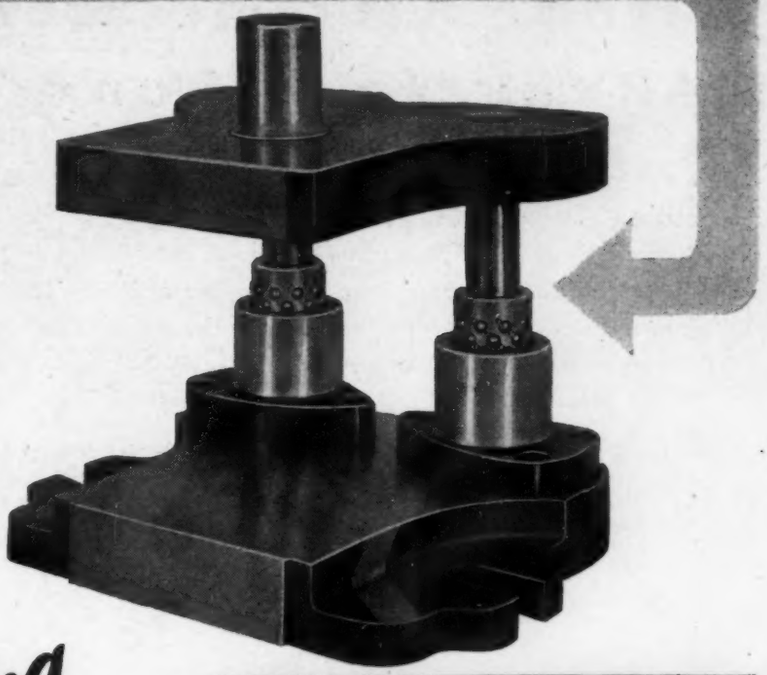
On this normal ground surface, the Brush Surface Analyzer shows a roughness of 20 micro-inches.



Superfinished surface, same scale. It shows a smoothness of 3 micro-inches.

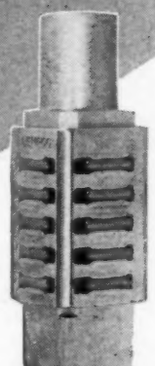


THE GISHOLT ROUND TABLE *represents the collective experience of leading specialists in the machining, surface finishing, and balancing of round and semi-round parts. We welcome your problems.*

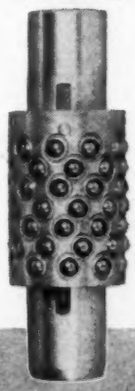


It's New.. Free-Operating ...Accurate!

IT'S A LEMPCO PRECISION ANTI-FRICTION DIE SET



SQUARE PIN ROLLER BEARING



ROUND PIN BALL BEARING

FOR increased die life . . . faster production . . . greater economy . . . put Lempco Anti-Friction Die Sets to work for you.

Lempco Die Sets are equipped with ball or roller bearing guide pins. As a result, dies can be set up by hand without the use of hammers, mauls, jacks or pry bars. This eliminates production delays caused by accidents to dies and punches . . . saves up to 60% in matching up and assembly time . . . means extra profit for you.

Lempco Anti-Friction Die Sets have been run over long periods on a conventional press as well as on special high speed presses. To assure positive accuracy, bearings have pre-load of .0015". All surfaces including extremely long bosses are ground to exceptionally close tolerance.

Place your order today and make sure you cash in on all the money-saving features offered by Lempco Precision Anti-Friction Die Sets.

LEMPCO

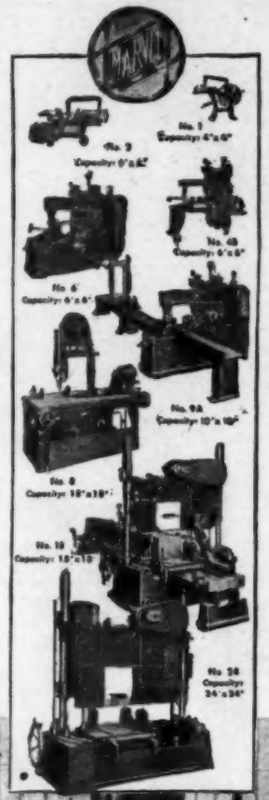
5711 DUNHAM ROAD
BEDFORD, OHIO, U.S.A.

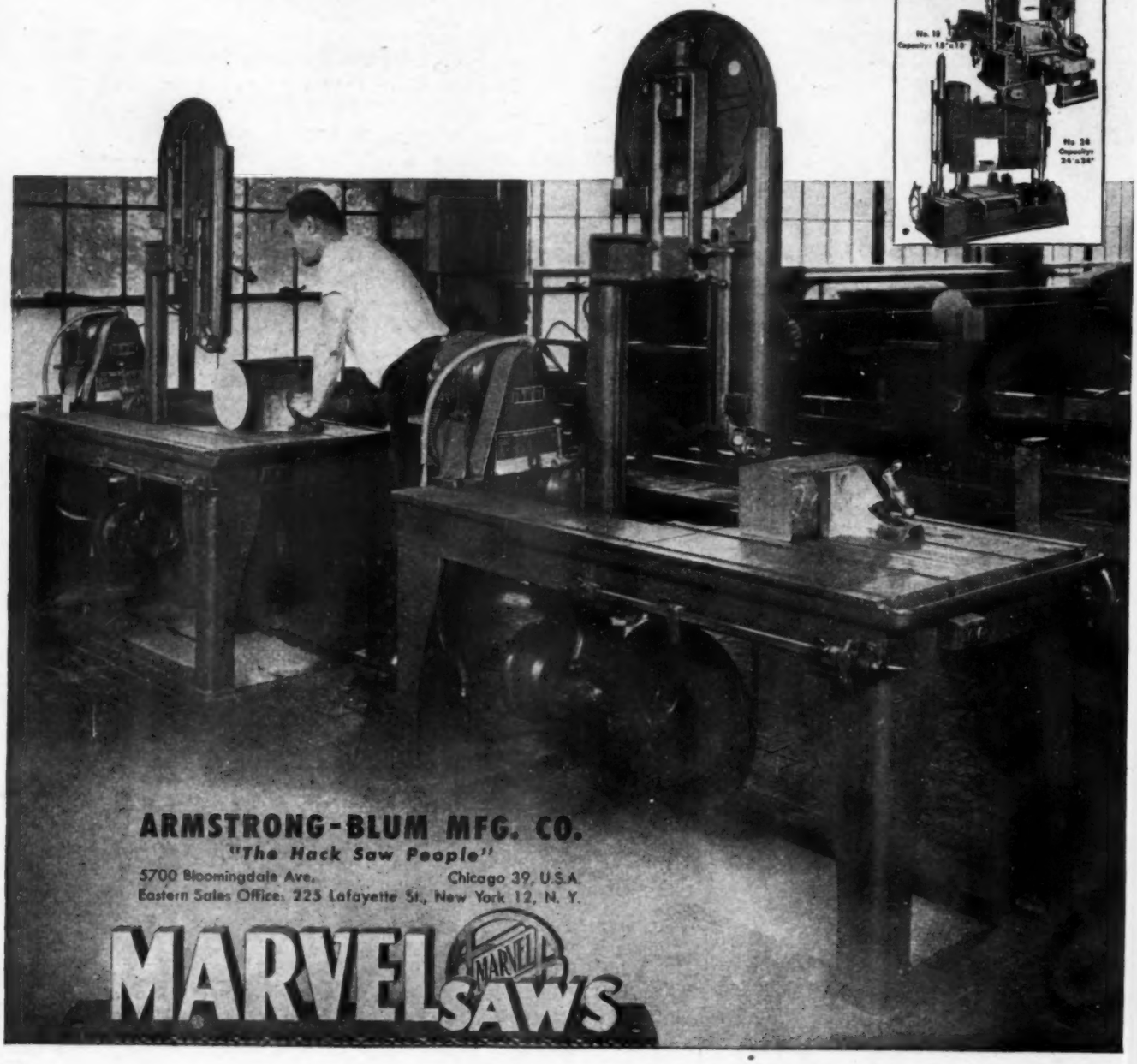
● *Write for "Facts About Lempco Precision Anti-Friction Die Sets." It's a fully illustrated catalog which lists all the advantages Lempco Die Sets have for you.*

Latrobe Electric Steel Warehouses MARVEL No. 8 Band Saws are Used

Not only in all Latrobe warehouses but at the mill too, MARVEL No. 8 metal-cutting Band Saws are used to cut expensive Tool and Alloy Steels accurately to specification. There are many reasons why the Latrobe Electric Steel Co. has standardized on the universal MARVEL No. 8. It is the most universal saw built—will cut the smallest pieces as well as the largest work up to 18" x 18" with equal accuracy, will cut at any angle, etc. . . . and, is easily operated and practically trouble-proof.

There is a MARVEL Saw for every need and budget. A local MARVEL Field Engineer will gladly discuss your problem with you, recommend the most suitable saw and demonstrate a MARVEL Saw in your vicinity. Consult your classified phone book or write us for address of nearest MARVEL Field Engineer.





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"The Hack Saw People"

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MARVEL SAWS

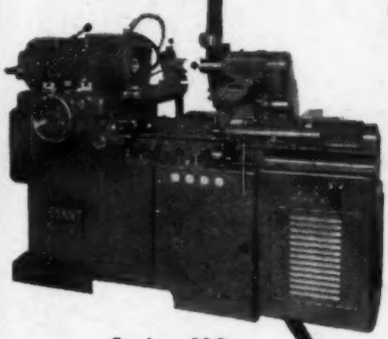
A fine line

of Internal Grinders
for every tool room
and production
requirement

Series 150

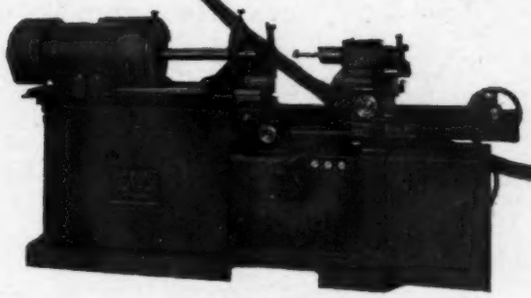
Series 107

BRYANT has designed and built precision internal grinders for 38 years. Today, their completely modern line covers the grinding of holes from .040" to 50" in diameter. Standard and special machines will grind straight, tapered, curved and irregular holes, or any of these in combination. Face and hole grinding can be combined to assure squareness. Cams and irregular holes can be ground by using the cam attachment. The Series 150 has a face plate 60" in diameter and will swing work up to 50". A special machine will take 100" swing. The Series 107 is equipped with Bryant High Frequency wheelheads giving speeds up to 100,000 R.P.M. for extremely small bores. Maximum swing of the 107 is 9". Series 112 machines are for general purpose tool room work. They incorporate many quick-changeover features and will swing 16". The 112-M machines are similar to the 112, but have provision for grinding long bores such as machine tool spindles. Series 212 grinders are completely automatic and will grind bores from 5/16" to 6" in diameter. The High Frequency head is used on the 212 for maximum efficiency on small bores. All these machines incorporate the exclusive Bryant feature of hardened and ground cylindrical slide construction and three-point bearing. Complete specifications are available on all Bryant precision internal grinders — write today.

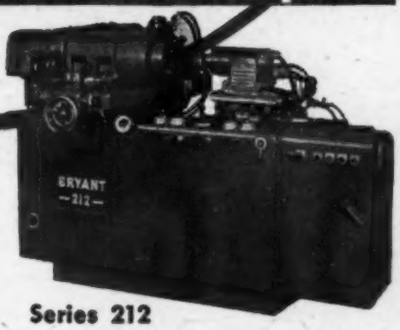


Series 112

BRYANT Postwar Development



Series 112 M



Series 212

Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT

How recently have you figured costs in Aluminum?

Figure today's cost of aluminum screw machine products on a pieces-per-pound basis. The answer makes Alcoa Aluminum Screw Machine Stock even more interesting.

Alcoa 11S-T3 is the aluminum alloy specially developed for use on automatic screw machines.

For best results, take advantage of Alcoa's 59 years of light metal experience. Write for the new booklet "Alcoa Aluminum in Automatic Screw Machines".

Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in leading cities.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

...all the versatility, accuracy and speed demanded by the *Silversmith!*

This H-P-M All-Hydraulic Press does one job today, another tomorrow—using single or double-action dies on shallow or deep draws, coining or embossing—practically every kind of press work. It produces at high speeds the accurate, finely finished parts demanded by the silversmith.

Whatever *your* drawing problem—

Small parts or "big as a bathtub", there's an H-P-M press to handle the job. You can get deep draws in fewer operations, faster and higher quality production. As a result, your products will cost less.

The exclusive H-P-M hydraulic blankholder design allows the metal to be formed without wrinkling or tearing. The draw is cushioned at the start and maintained at predetermined speeds and pressures. Since both press and power unit are designed and built by one company—H-P-M—the user is assured of undivided responsibility for press performance.

THE HYDRAULIC PRESS MANUFACTURING CO.
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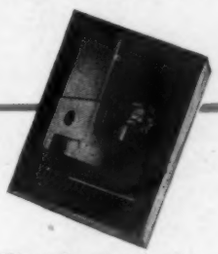
150-ton H-P-M double-action press drawing teapot bodies in the plant of Reed and Barton, Silversmiths, Taunton, Mass.



Write for your free copy of Bulletin 4400. It tells you how high speed press operation is accomplished with the patented H-P-M closed circuit.

Offices in New York, Philadelphia, Cincinnati, Cleveland, Detroit and Chicago. Representatives in other principal cities. Export Dept.: 500 Fifth Avenue, New York, N. Y., Cable—"Hydraulic"

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Metal Working Presses

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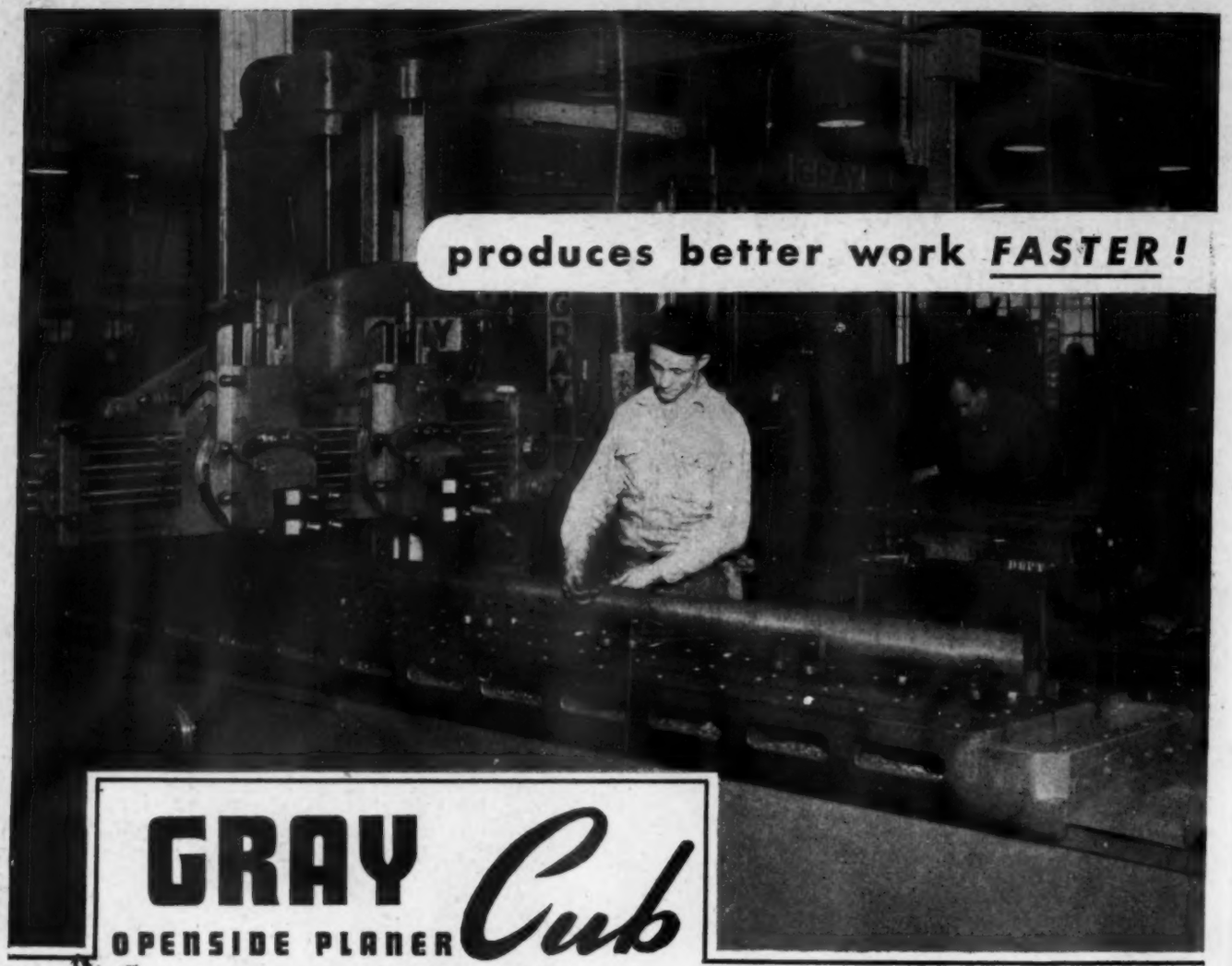

produces better work *FASTER!*

GRAY *Cub*

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"A Bear for Production"

1. The planer for Carbide Tools—cutting and return speeds up to 300′ per minute.
2. Speed of cut and return instantly adjustable from operating position.
3. Table started in either direction, reversed, "inched", or stopped from pendant switch.
4. Single-Shift power rapid traverse controlled at the heads or from either end of rail.
5. Space Saver Drive, with Full Floating drive Shaft.
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7. Loop Lubrication. The only adequate system for high speed reciprocating tables.
8. Mechanical non-shock tool lifters.
9. Side head feed independent of rail heads.
10. Built in 24″, 30″ and 36″ sizes.

DOUBLE HOUSING and OPENSIDE PLANERS
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SWITCH PLANERS
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DIE BLOCK PLANERS
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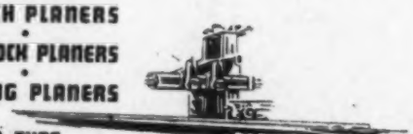
MILLING PLANERS

PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

➔ *Write for fully illustrated descriptive Bulletin No. 55*



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CINCINNATI 7, OHIO, U. S. A.

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The World's Finest JIG Boring and Milling Machine

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

THE TOUGHER THE SERVICE THE BETTER THE TEST...

Many small tools are capable of handling easy jobs with a certain degree of efficiency and economy, whereas on the tough job they might not stand the gaff.

Today, most jobs are tough, calling for tough tools. Then too, because of small tool shortage, all tools must sooner or later be assigned to gruelling service making it imperative that every small tool be capable of maximum performance in long, hard work.

The test of UNION TOOLS is to put them to work under today's conditions and let results dictate the tools you buy. On such a basis UNION will be the "Tools You Buy Again."

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

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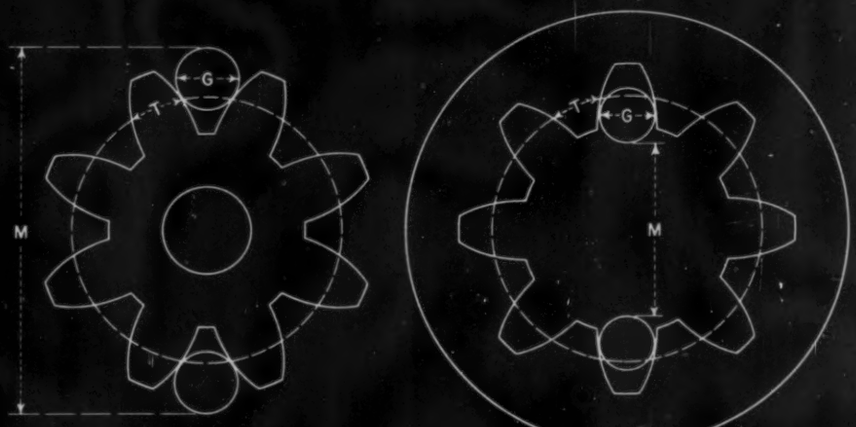
UNION

Van Keuren



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SIMPLE . . . The only calculation required is one of silmple division.

RELIABLE . . . The system is favored by outstanding American Gear Manufacturers.

ACCURATE . . . The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and cutter must be fed further into the gear blank. Exact constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.

ULTIMATE ACCURACY

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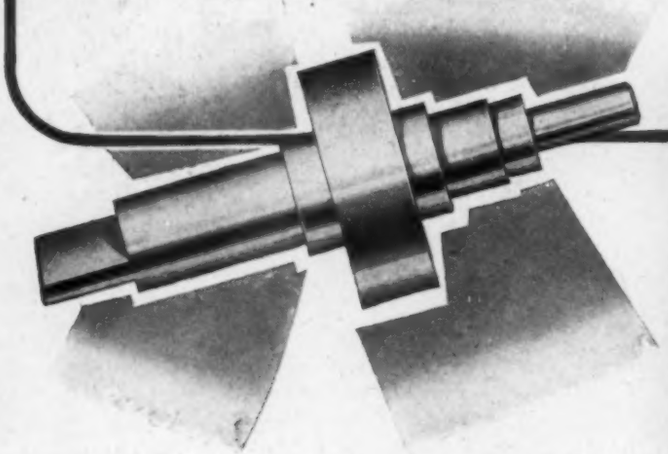
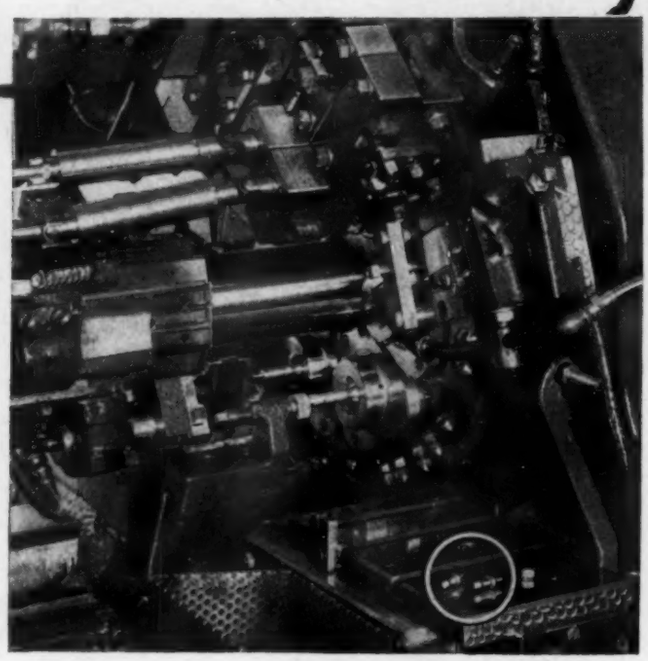
28th YEAR

8 operations in 4 seconds

The part is a brass pinion blank, one inch long, 3/8" diameter.

The eight operations include shaving six diameters for fine concentricity, and milling flats on large end. The entire job is completely finished in 4 seconds machine time—900 finished parts per hour. This is *fast* production time.





National Acme offers you something more than a series of production machines.

Improved methods of tooling and handling parts are important factors by which Acme-Gridley 4, 6 and 8 spindle automatics are making new cost-reduction records in hundreds of mass production shops.

This they accomplish by reducing *machine time*—a vital consideration when both raw material costs and hourly wage rates are at high levels.

Write us about possible time-saving improvements in your own shop.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

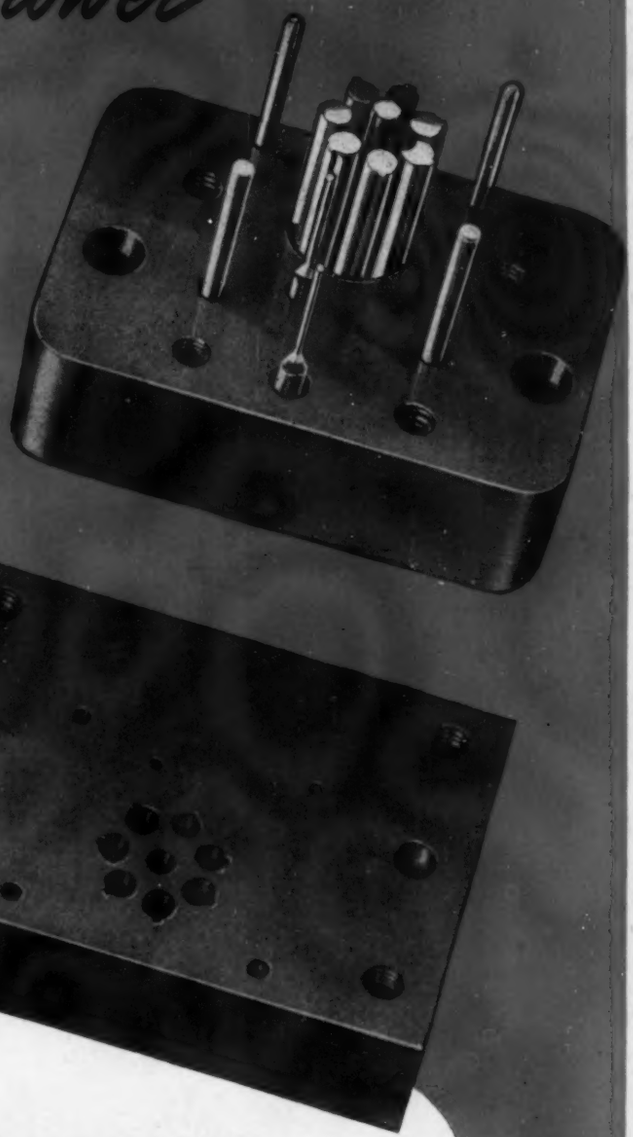
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

TODAY'S *Keynote*

PRODUCTION ECONOMY

TODAY'S *answer*

INVARO



These Invaro oil-hardening steel blanking dies are meeting a difficult requirement of close tolerance—held to .003 after heat treating . . . no tendency to shrink, warp or change dimensions. Uniform hardness and long life mean high production at low cost. Look into Invaro for operations such as blanking, punching, forming, piercing, perforating.

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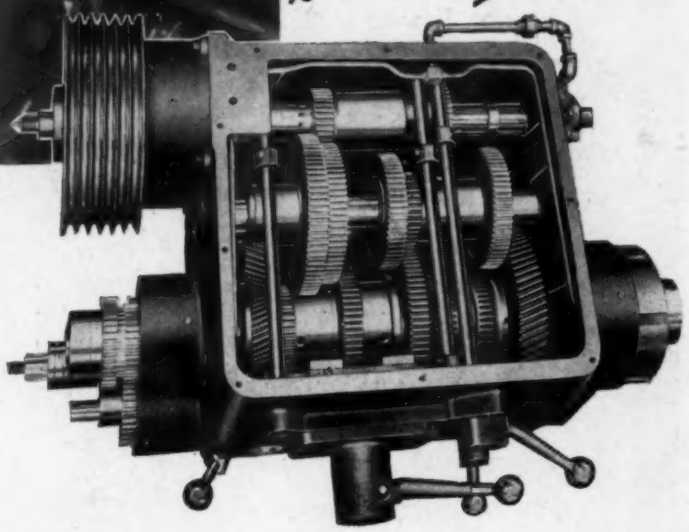
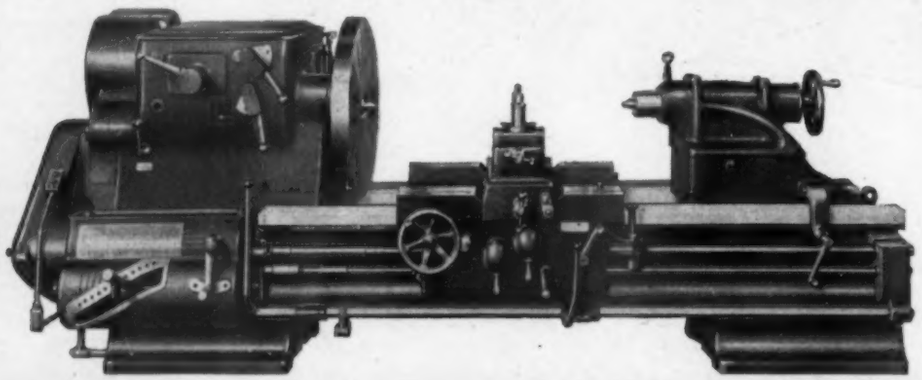
FOR HEAVIER CUTS USE THE

SPRINGFIELD
GEARED HEAD LATHE

It stays in alignment

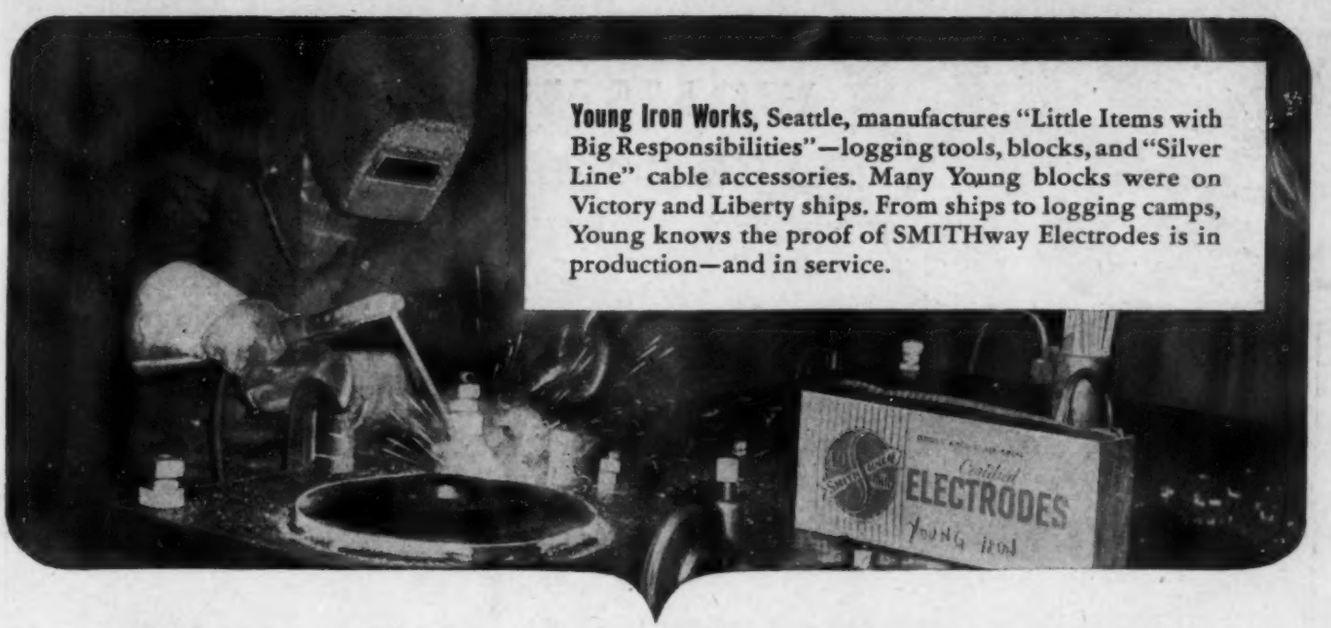


Constant accuracy in hard service is a characteristic of every Springfield Lathe. Construction — extra heavy throughout—reflects a knowledge and practical application of the features that mean profitable lathe operation for you. In the Headstock alone are many factors that contribute to accurate, economical production. A twelve speed spur gear design, the Springfield Headstock uses a helical back gear train and has fourteen large chrome Molybdenum gears with ground teeth. Only seven gears are in mesh at any time—each speed position has a special interlocking device to keep each gear in proper position.



Illustrated bulletins describing Springfield 14" to 30" Lathes will be sent to you on request. Write for them.

THE SPRINGFIELD MACHINE TOOL CO. • SPRINGFIELD, OHIO



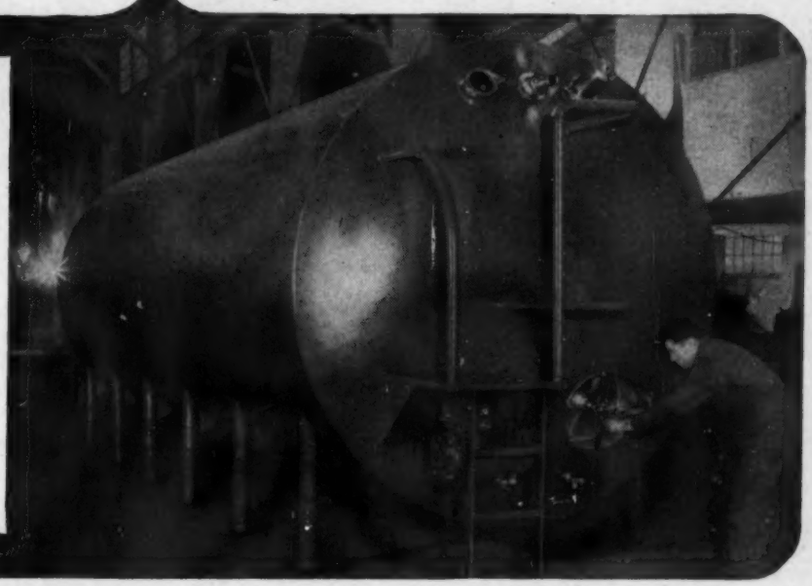
Young Iron Works, Seattle, manufactures "Little Items with Big Responsibilities"—logging tools, blocks, and "Silver Line" cable accessories. Many Young blocks were on Victory and Liberty ships. From ships to logging camps, Young knows the proof of SMITHway Electrodes is in production—and in service.

YOUNG IRON WORKS

PUGET SOUND SHEET METAL WORKS

Both use SMITHway *Certified* Electrodes

Puget Sound Sheet Metal Works, Seattle, producer of custom-built equipment in stainless, clad, and mild steel for industry, knows the value of A. O. Smith welding research. For custom work and for production-line jobs, SMITHway Electrodes make welding the modern tool for all kinds of jobs in all kinds of shops.



SMITHway *Certified* Welding Electrodes—Made *by* Welders . . . *for* Welders

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GET THE FACTS ON SMITHway A. C. WELDERS!

Models for every kind of welding job—cover every welding range. Lightweight, compact, highly efficient. Write for specifications and prices.

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CUT OPERATING COSTS

● Forged from carbon steel, specially-processed to exacting specifications, Williams' "Superior" Wrenches average 93% as strong as corresponding alloy wrenches costing almost twice as much. Their strength is almost double that of old-fashioned carbon steel wrenches. "Superior" Wrenches are available in a wide range of patterns and sizes. Sold by leading Industrial Distributors everywhere.

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DROP-FORGINGS AND DROP-FORGED TOOLS

Unusual Capacity Describes

The HARDINGE Precision Dividing Heads

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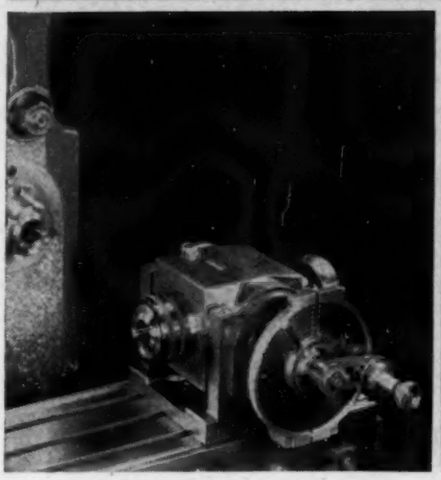
THESE ARE FEATURES WHICH YOU GET WHEN YOU PURCHASE HARDINGE TM OR UM MILLING MACHINES.

WRITE FOR BULLETIN TM-UM

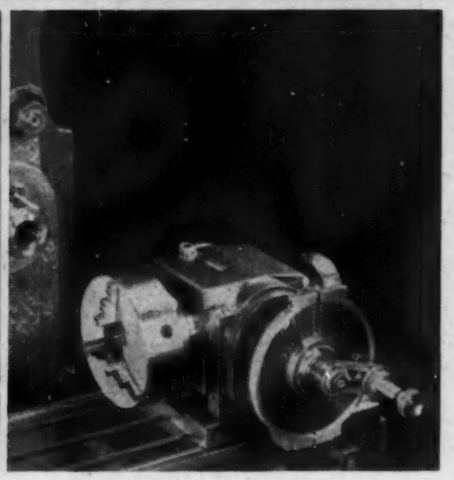


1" COLLET CAPACITY

5C HARDINGE Collets fit directly into the spindle — providing a through spindle capacity of 1". The collet is the same as used in the cutter spindle. Collets can be used with the dividing head set at any angle from horizontal to the vertical position.

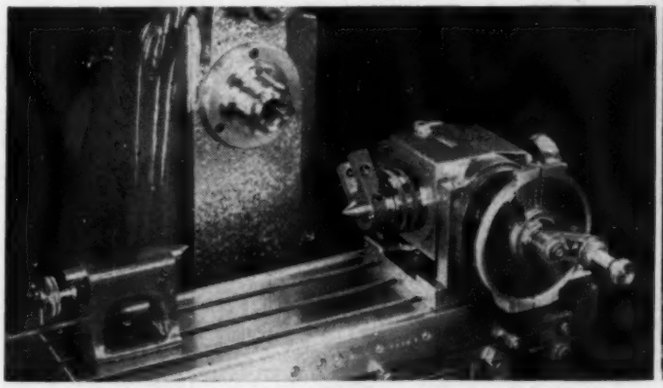
6" STEP CHUCK CAPACITY

The dividing head spindle takes standard step chucks and closers, providing collet type chucking from 1" to 6" diameters. Step chucks are available in the following capacities—2", 3", 4", 5", and 6". Step chucks can be used with the dividing head set at any angle from horizontal to the vertical position.

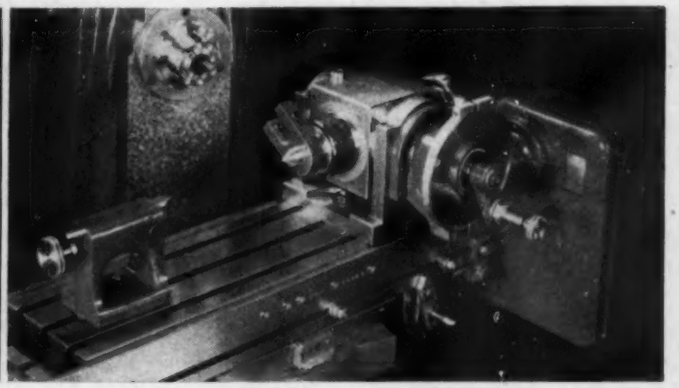


5" JAW CHUCK CAPACITY

Three jaw universal or four jaw independent chucks provide chucking capacity up to 5" in diameter and 1-5/32" through the spindle. The chucks have integral mounts for direct application to the spindle. The jaw chucks can be used with the dividing head set at any angle from horizontal to the vertical position.



Set-up for plain milling on HARDINGE TM Milling Machine



Set-up for spiral milling on HARDINGE UM Milling Machine

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

NEW SOUTH BEND 9" LATHE CATALOG

Write for it today!

LARGER SIZE LATHES

South Bend Precision Lathes also made with 10", 13", 14½", and 16" swings. Write for information.

Designed and built to do precision work, the South Bend 9" Precision Lathe is the ideal lathe for the production of small accurate parts, for toolroom work, and for use wherever extreme exactness is essential in the working of metal, plastics, fibre, or other machinable materials.

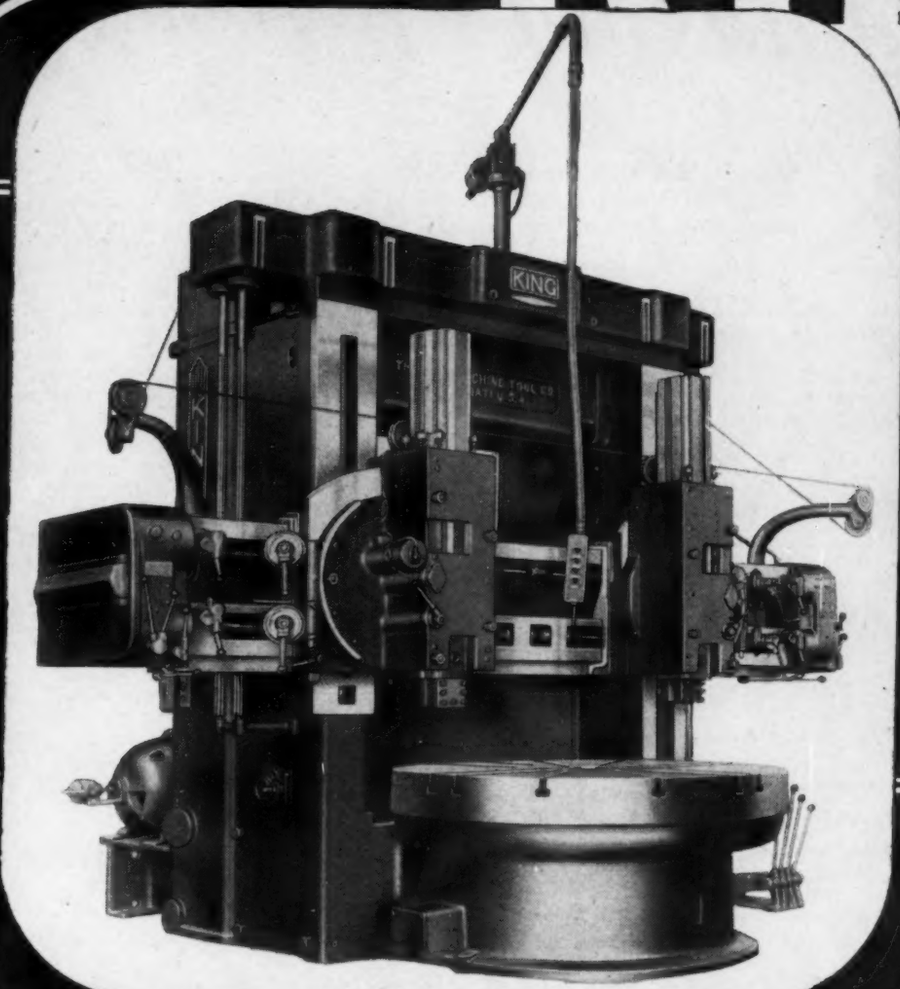
Catalog 9-J illustrates in full color all models of the South Bend 9" Precision Lathe; lists capacities, speeds, feeds, and general specifications; and shows available attachments and accessories. Mailed on request — write for Catalog 9-J, today!

BUILDING BETTER LATHES SINCE 1906

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

YOU CAN CUT COSTS with the KING



● Our experience with the New Series King plus the reports we receive from users indicate clearly that you can cut your present costs with this new machine.

It has the power, rigidity, and speed to use carbide tools to the limit of their capacity. On the variable speed drive machine, table speeds can be changed without stopping the table.

The machine is easy to operate with all controls conveniently located at the front within instant reach of the operator from his normal working position.

Then too, you have a range of speeds—high or low—to meet every operating requirement, within the range of sound engineering practice.

If you, like numerous other manufacturers, are searching for ways to cut your costs—investigate the new series KING.

Available in ten sizes—30", 36", 42", 5 2", 62", 72", 84", 100", 120", and 144".

THE KING MACHINE TOOL COMPANY
CINCINNATI 29, OHIO
Builders of Vertical Boring and Turning Machines Exclusively

This 12,500% increase *sounds fantastic!*

But True!

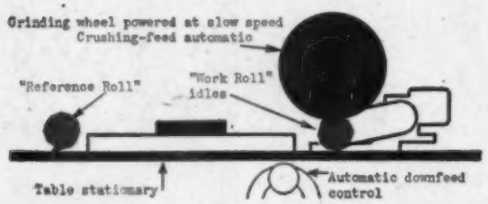
One of the major drawbacks to crush form grinding precision flat form contours has been the inability to produce on a practical production basis. This obstacle has been eliminated in two ways by the new Thompson Truforming Process.

First: Truform Grinders are engineered and built as a single unit, eliminating the failures of make-shift crushing arrangements and attachments.

Second: TWO CRUSHING ROLLS ARE USED. This is a major advancement, because it greatly extends crushing roll life and makes possible, for the first time, quantity production without constantly disturbing the set-up to re-process the crushing roll.

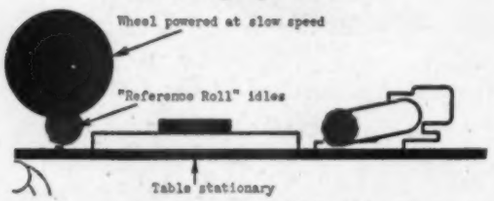
How two rolls operate in the Truforming Process is briefly illustrated and described below. The normal crushing or truing position is shown first.

Normal Crushing Position
Also Truing or Dressing



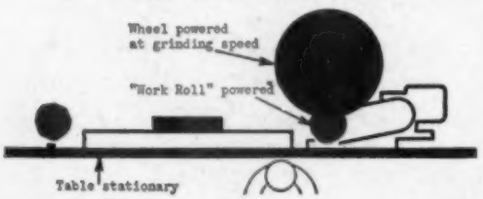
This is the position for the initial crushing of the wheel—and for subsequent truing or dressings when production grinding. On an eight pitch modified buttress thread form, 125 dressings were provided by the "work roll" before losing form.

Touching-up Position



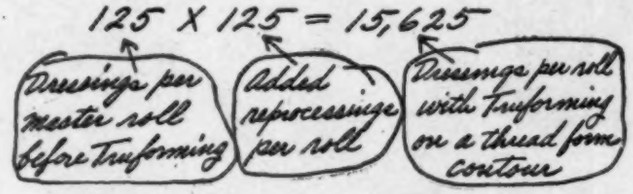
When the "work roll" loses form the table is moved to bring the grinding wheel over the "reference roll" for touching up, as shown above.

Re-processing Position



Because both rolls are table mounted, are in perfect alignment, and can be brought in the same relation to the grinding wheel, the original degree of accuracy can be quickly transferred from the "reference roll" back into the grinding wheel . . . and then ground back into the "work roll" as shown above.

The machine is then ready for production grinding again without disturbing the set-up or removing anything from the machine. In this way the "work roll" can be re-processed whenever it loses form and can be used for hundreds of additional dressings, or until it is worn out. Duplicate crushing rolls can be ground in the same way on all Thompson Truform Grinders.


125 X 125 = 15,625
Dressings per master roll before Truforming
Added reprocessings per roll
Dressings per roll with Truforming on a thread form contour

What this means in savings is illustrated by the following example, involving a modified buttress thread form with an eight pitch form. Where two rolls are used in the Thompson Truform Process, it was possible to get *over 15,625 dressings* from the "work roll" before it was worn out. This meant an increase in continuous production (without changing or disturbing set-up) of 12,500%.

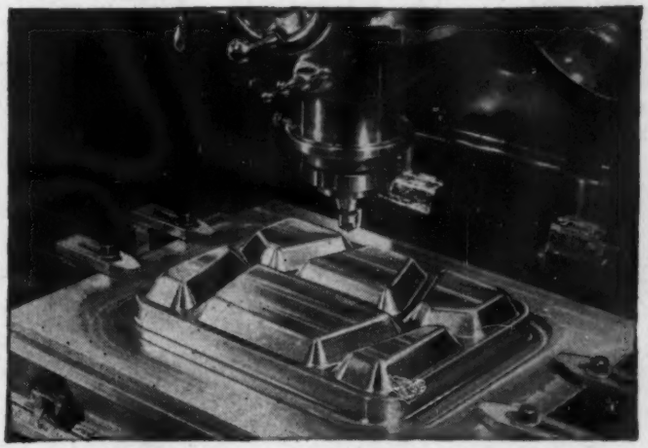
Write for the new 8-page Truform Leaflet—"Why didn't you tell me about this process before?"

Address Dept. 10

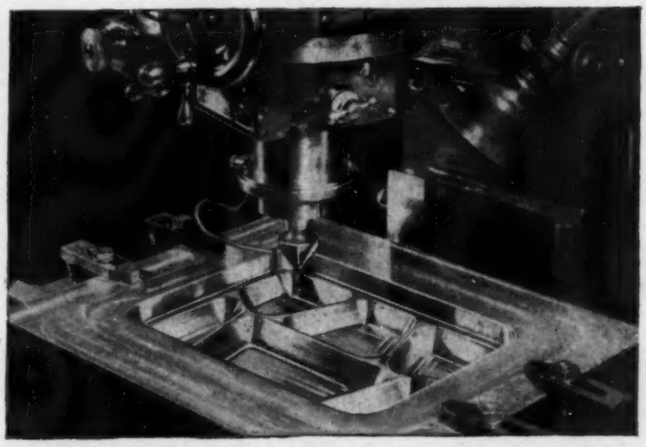
The Thompson Grinder Company • Springfield, Ohio

How One Machine Scribed and Machined this Complex Mold — and Made its Own Cutters!

1 **FAST!** The job, a plastic serving tray, required special angles and radii in its cavities. The Model 2D Rotary Head milling machine — a Kearney & Trecker development — completely milled the 3 special form cutters to correct size and shape, including relief and chip clearances.



2 **DIRECT!** The operator accurately located the mold blocks in relation to the Rotary Head center. All layout work, rough and finish milling then were completed with one clamping of the workpiece. No models or templets were required. The blueprint was the only guide necessary.



3 **ACCURATE!** Completing the work in a single setup greatly reduced the chance for error. Precision measuring devices and complete control of all combinations of cutter movements, both angular and radial, made this a simple job of geometric construction for the operator.

4 For more facts of how you can get Fast, Direct, Accurate results on other mold, tool, die, pattern, toolroom and general production work, using the Rotary Head Method, write for bulletin 1002C on the Model 2D Rotary Head Milling Machine.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN 4720

ON *One* PRECISION LATHE DO ALL THIS AND IN LESS TIME . . .

- BALL TURNING
- SPIRAL CUTTING
- MILLING
- GRINDING
- MULTIPLE OPERATIONS
- RELIEVING
- SLOTTING
- FORMING
- TAPER TURNING

All possible through precision-made attachments.

The Rivett No. 608 back-geared, screw cutting lathe for tool making and instrument shops, handles an endless variety of jobs in minimum time. This small but exceedingly proficient lathe with slide areas equal to that of one twice its size, permits the operator to finish his work completely without employing other machines.

WRITE FOR BULLETIN NO. 608

GUARANTEE

The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. It will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. It will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

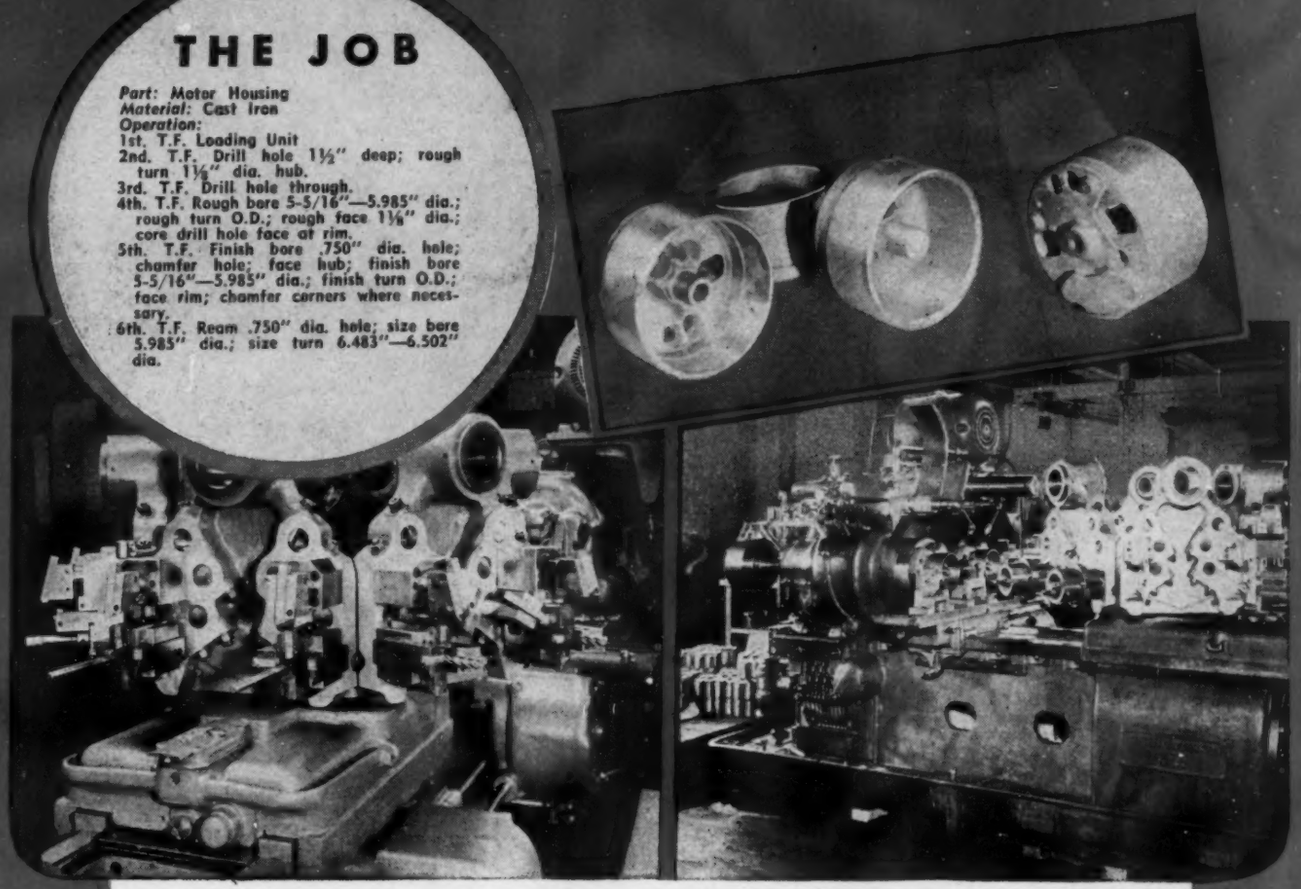
RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U. S. A.

Tooling on a P&J 5 D 2 AUTOMATIC contributes to Outstanding Production Performance

THE JOB

Part: Motor Housing
Material: Cast Iron
Operation:
1st. T.F. Loading Unit
2nd. T.F. Drill hole 1½" deep; rough turn 1½" dia. hub.
3rd. T.F. Drill hole through.
4th. T.F. Rough bore 5-5/16"—5.985" dia.; rough turn O.D.; rough face 1⅛" dia.; core drill hole face at rim.
5th. T.F. Finish bore .750" dia. hole; chamfer hole; face hub; finish bore 5-5/16"—5.985" dia.; finish turn O.D.; face rim; chamfer corners where necessary.
6th. T.F. Ream .750" dia. hole; size bore 5.985" dia.; size turn 6.483"—6.502" dia.



Ability to duplicate the cast iron motor housings shown here quickly and accurately on the P&J 5D2 Automatic is the result of planned tooling and the well-known productivity of two-spindle performance. The actual figures for floor-to-floor time and number of pieces per hour are outstanding and will be furnished on request.

All P&J machines have the inherent advantage of tooling flexibility, making possible not only special tooling for each specific job but also the means of changeover in tooling for the wide range of jobs that can be handled on these highly productive machines.

Utmost turret stability is assured by the rigid type overhead pilot which is characteristic of P&J design. This feature together with ample power makes it possible to produce accurately at high speed and low maintenance. Operating convenience results in minimum fatigue and conserves man-power.

Our engineers are ready to help you cut costs in duplicate parts production and welcome an opportunity to show you how it can be done.

THE POTTER & JOHNSTON MACHINE CO.

Pawtucket Rhode Island

Staples Tool Engineers look in . . .

*UNEXPECTED PLACES!

To help you SAVE on Tool Costs and AVOID Production Lags

*Unexpected Places

often are routine, high production hole cutting operations, where high tool costs are accepted as *normal* (by the manufacturer) for the work produced. Here is a typical—and actual—example:

A prominent automotive manufacturer, using H.S.S. reamers for finishing close tolerance holes in cylinder blocks, found this operation lagging far behind in production. Due to the material being reamed, the tools became dull after running two to three hours, causing frequent down time for changing tools. Overtime did not eliminate the bottleneck, and a second machine was ordered for this operation.

Staples Tool Engineers recommended a trial using special Staples Carboloy-tipped Reamers. As a result, the operation is now run continuously for *four days* without a shut-down for tool resharpening—and the required work output is maintained without the addition of a second machine.

Tools that produce savings such as these are worth a trial in *your* production. Call in a Staples Tool Engineer for an on-the-job demonstration. There is no obligation.

THE STAPLES TOOL COMPANY

CINCINNATI 25 OHIO

Distributors in Major Cities

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

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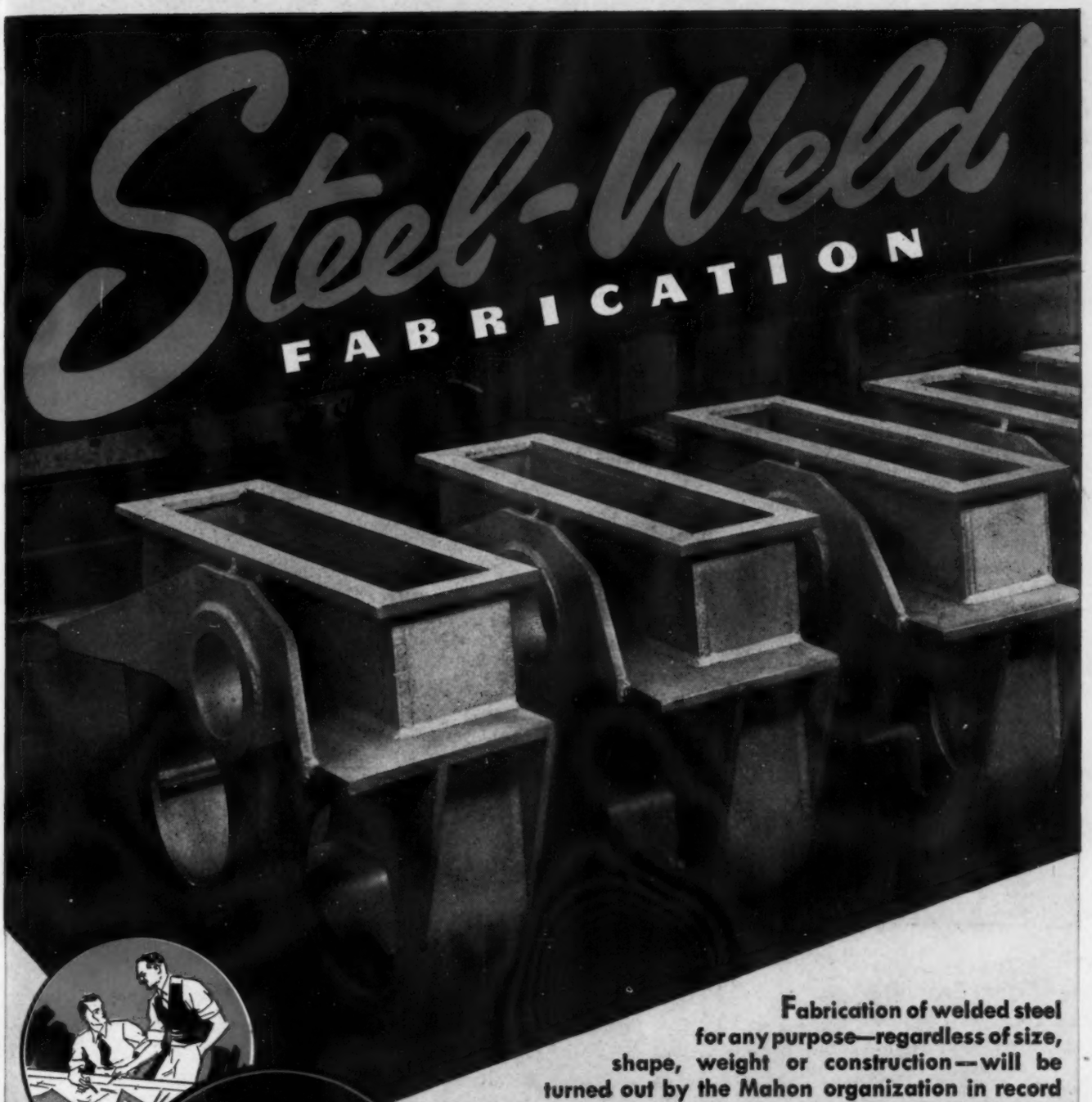

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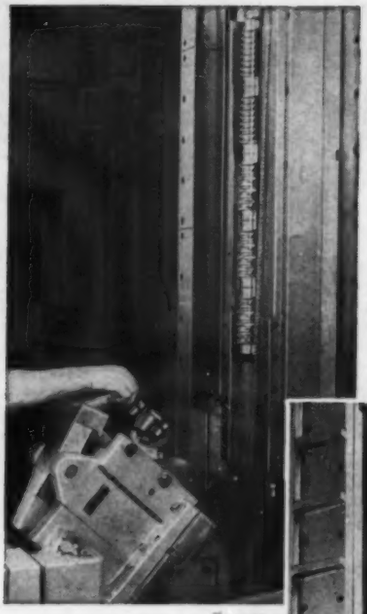
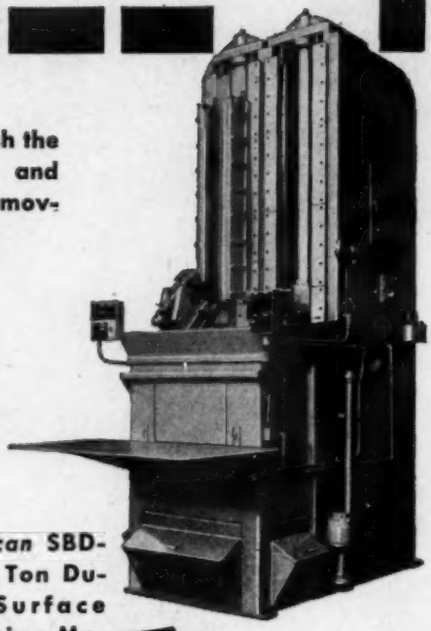
BEARING CAP SETS BROACHED EN BLOC

This *American* Duplex Surface Broaching Machine is tooled up to broach automotive main bearing caps, producing complete sets for 100 motors per hour.

When you are planning metal shaping or finishing work, make use of *American's* complete broaching service—machines, tools, and engineering. You are under no obligation when you SEE *American* FIRST!

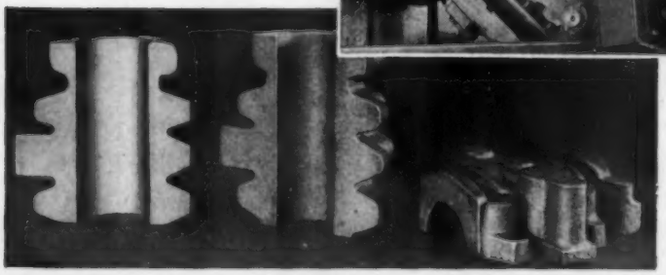


Operation at the left is to finish the joint face and bearing lock and semi-finish the half round, removing 1/8 stock on each surface.



American SBD-66-25 Ton Duplex Surface Broaching Machine with tilting type work tables.

Operation at right straddle broaches the two ends of the casting.



Above: Right to left: 1. The rough casting. 2. Ends straddle broached. 3. Joint face, bearing lock and half round broached.

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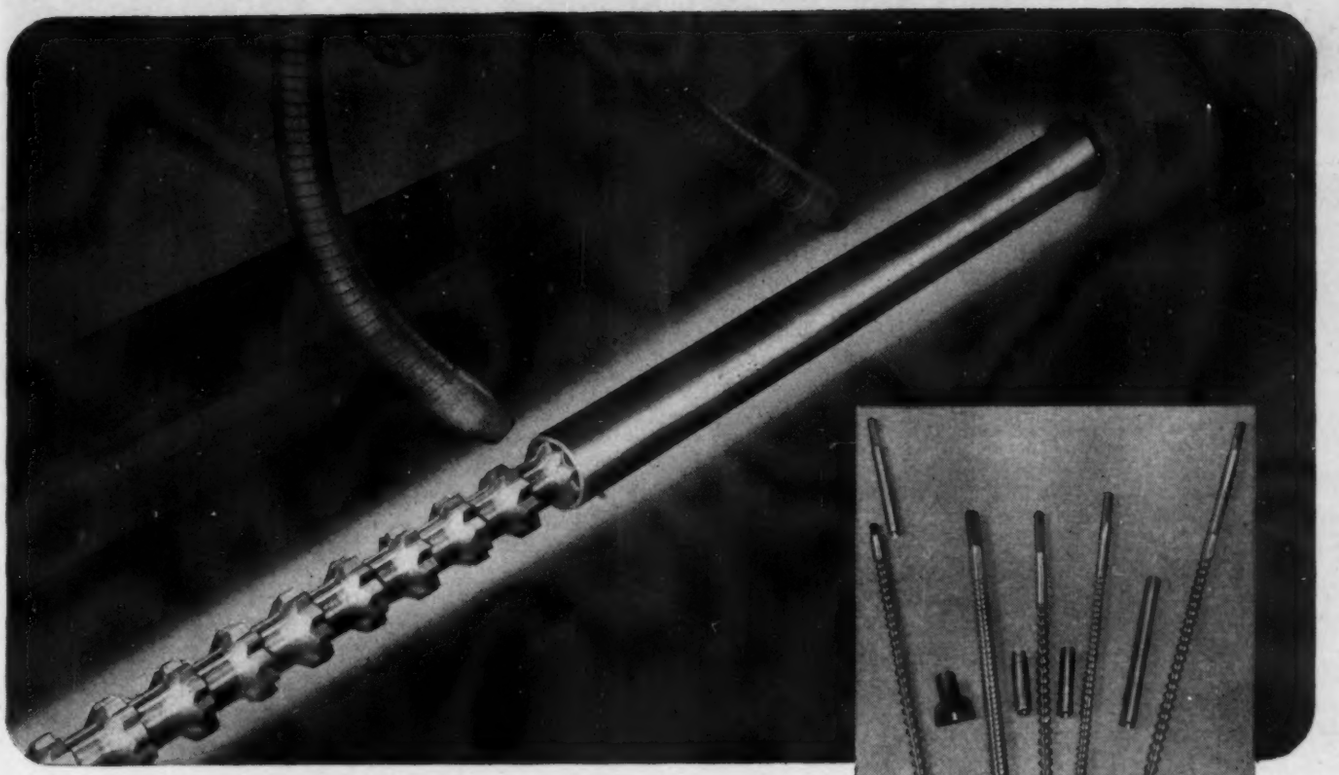
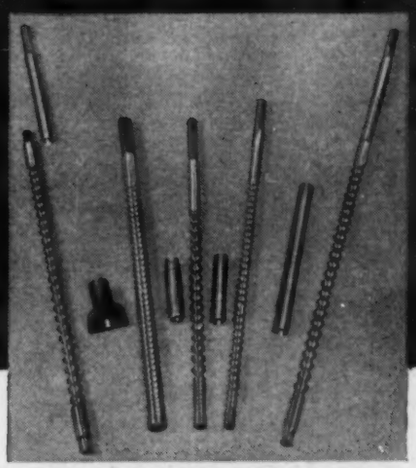
DIVISION OF SUNDSTRAND MACHINE TOOL CO.





ROTOR-KUT broaches used in broaching both ferrous and non-ferrous tubing. The long end broaches give a very fine finish to the large tube at right and show the detachable shank feature.

INSIDE IDEAS AND INFORMATION

Broaching metal tubing interiors to a fine finish is a new idea in modern machining. Devised by Lapointe engineers, this method supplants honing and produces substantial savings of time and money.

The 16 micro-inch finish required for tubing used in many hydraulic controls and precision instruments is readily achieved by the combination ROTOR-KUT broach which can be used with several Lapointe broaching machines. Tubes of steel, brass, and bronze, as large as 28 inches in length and 2 inches inside diameter, have been successfully broached by this process.

Among the features of the ROTOR-KUT broach in this operation is the use of detachable shanks, made of less expensive steel than the broach. This reduces the risk of tool breakage and minimizes the use of costly High Speed steel. One pass of this unique broach usually accomplishes the desired result when the proper technique is employed.

To aid industry in acquiring this technique and supply information on the most effective use of the process, Lapointe engineers are ready to instruct plant personnel in operating procedure.

For new ideas on how broaching can benefit *your* business, and for complete cooperation and information on broaching operations, let Lapointe engineers assist you in solving your production problems.

THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

Write Dept. U today for the ROTOR-KUT broach folder.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

There is No Substitute For a Spring Washer

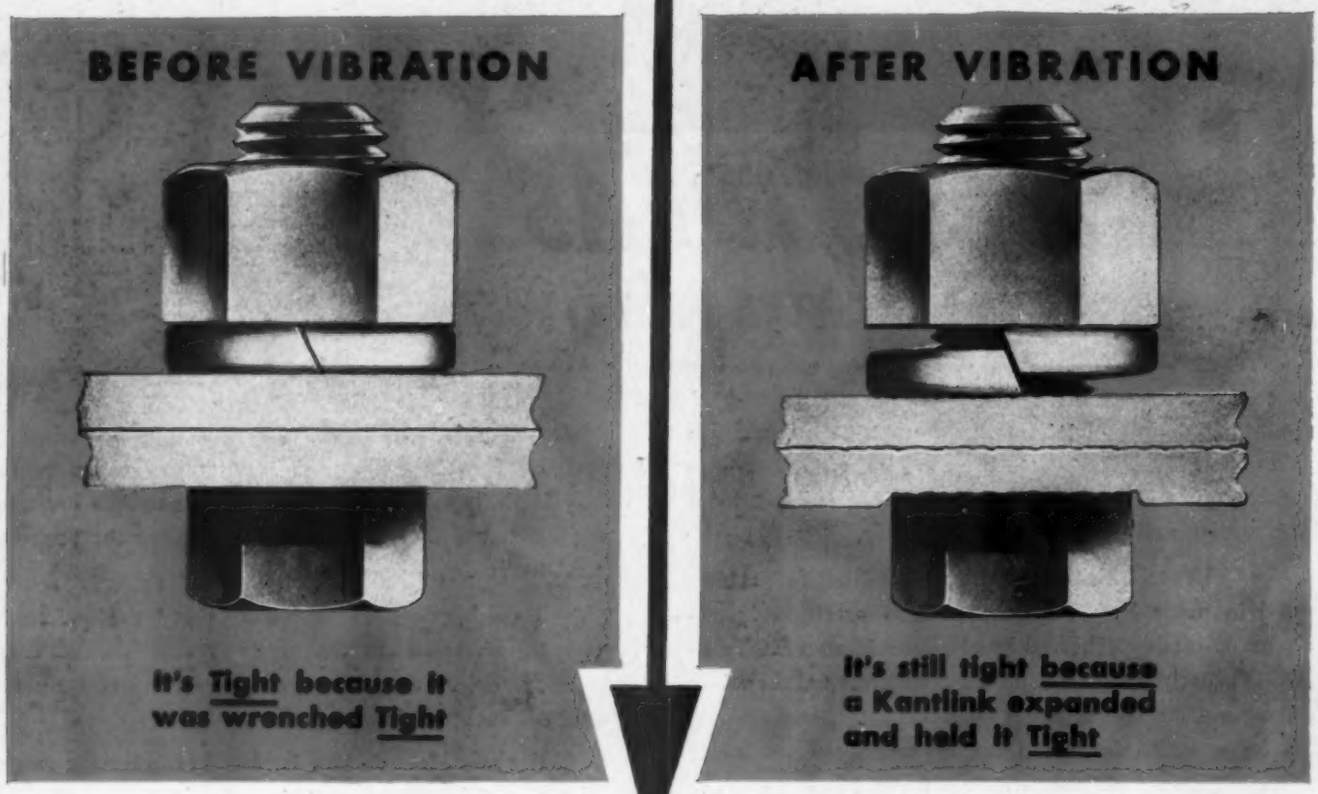
Every practical man knows that wear occurs when vibrating metal contacts metal; even when seemingly bolted tight.

He knows that bolted assemblies loosen because of bolt stretch, and the frictional wear of burrs, flares, and the pulverizing of paint, scale and rust.

He knows that even if the nut never budges, the other parts of assemblies wear loose unless a strong spring washer is used to expand as wear occurs—to expand continually, over long range if necessary, to hold all parts tight longer.

There is no substitute.

On all assemblies specify Kantlink spring washers for real bolted security.


BEFORE VIBRATION
It's Tight because it was wrenched Tight
AFTER VIBRATION
It's still tight because a Kantlink expanded and held it Tight

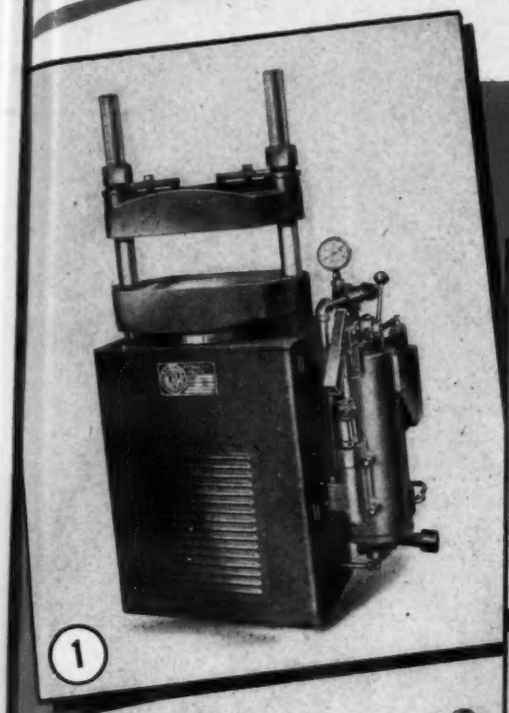
Originators of KANTLINK the long-range spring washer

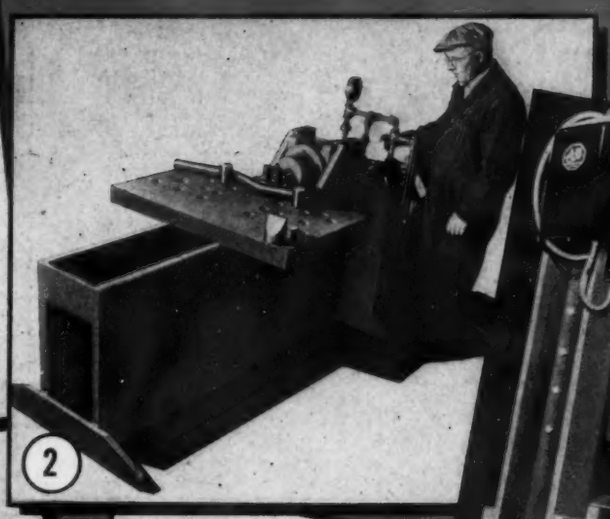
THE NATIONAL LOCK WASHER COMPANY

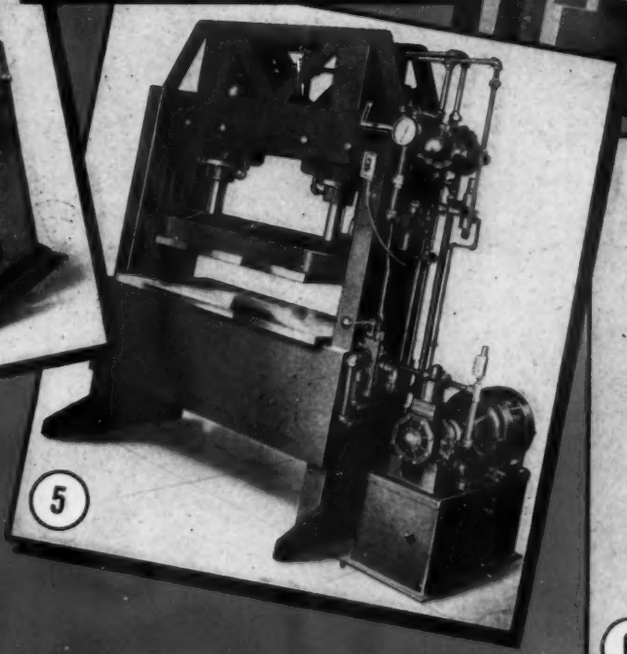
Newark 5, New Jersey — Milwaukee 2, Wisconsin

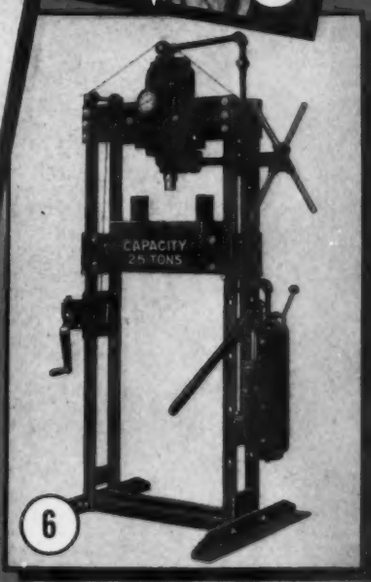
NAME IT... AND YOU CAN HAVE IT!!

KRW MAKES ALL KINDS OF HYDRAULIC PRESS ADAPTATIONS...TELL US WHAT YOU WANT, WE EITHER HAVE IT OR WE WILL MAKE IT









1. Plastic Molding Press. 2. Bending Press. 3. Stamping Press. 4. Horizontal Press. 5. Forming Press. 6. Motor-driven Arbor Press.

KRW Hydraulic Presses are available in tonnages ranging from 25 to 100-tons and either hand-operated, air-operated or motor-driven.

NAME IT...
MAIL COUPON TODAY

K. R. WILSON
BUFFALO 3, NEW YORK

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K. R. WILSON, 215 MAIN ST., BUFFALO 3, N. Y.

Please furnish information and prices on

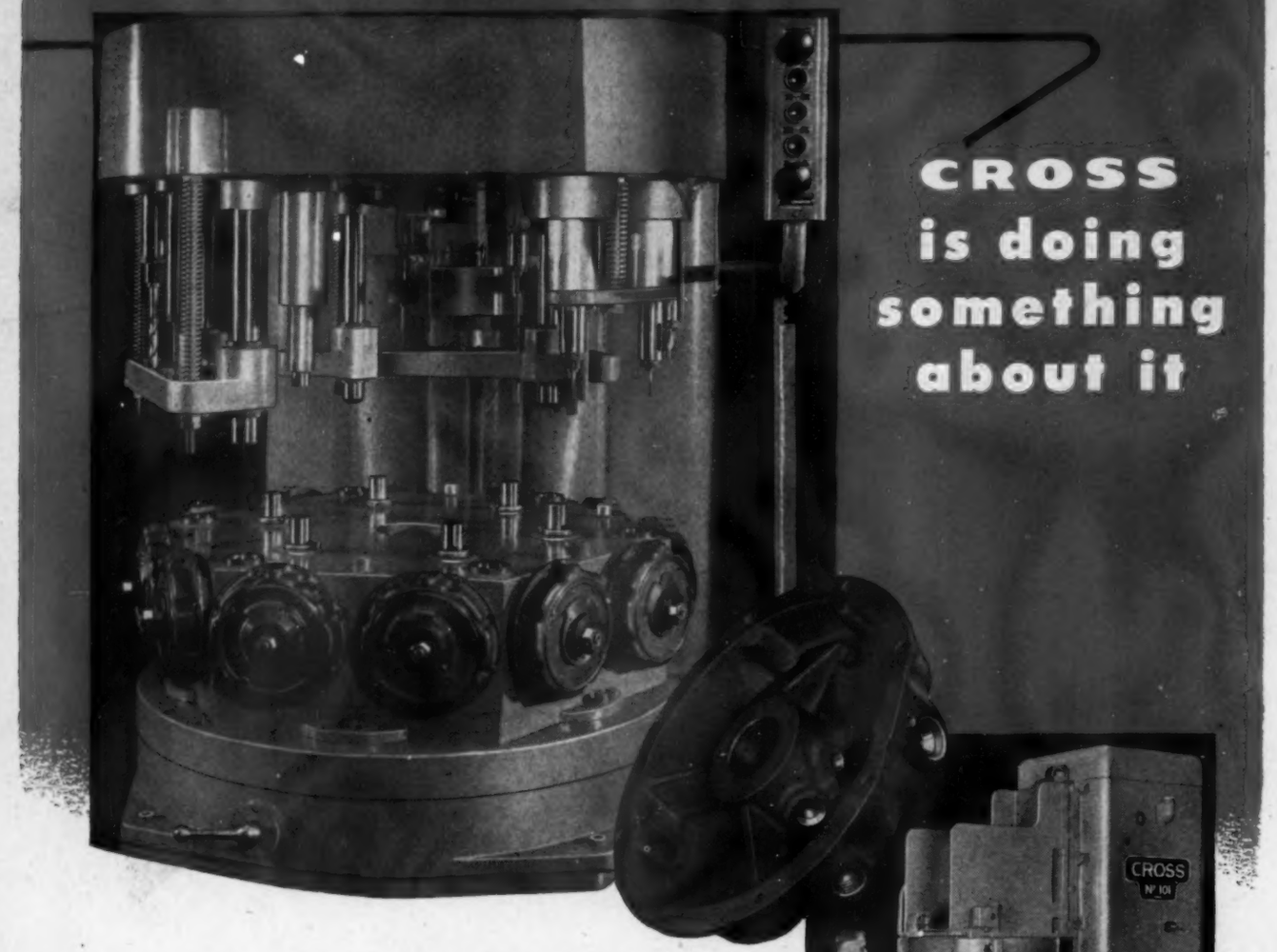
Plastic Presses ☐ Bending Presses ☐ Stamping Presses ☐
Horizontal Presses ☐ Forming Presses ☐ Arbor Presses ☐

Firm_____

Address_____

City and Zone_____ State_____

Everybody's Talking "Cost Reduction"

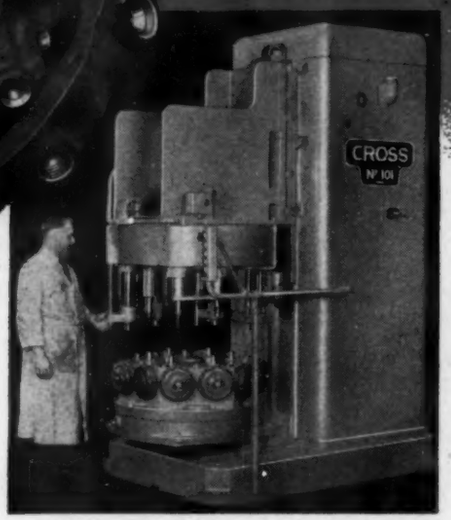


CROSS is doing something about it

THE PROVEN and practical way to reduce production costs—and selling prices—is to increase the productivity of a given amount of human effort.

The objective behind Cross designs always has been to reduce production costs by enabling men to accomplish more in a given length of time. Invariably these cost reductions have been accompanied by improvement in quality.

Cross special machine tools and methods will help you produce more with less effort.



The drilling, reaming, spot-facing, and tapping machine with indexing fixture, as illustrated, is typical of Cross ingenuity applied to a specific problem.

THE **CROSS** COMPANY

Established 1898

©1947—THE CROSS COMPANY

SPECIAL MACHINE TOOLS

DETROIT 7, MICHIGAN

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

Their savings mean lower operating costs

NEWTON HYDRAULIC FEED COLD SAW MACHINES

The new Newton Cold Saw Machine Bulletin No. 537 is now ready. Write for your copy—today.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL TOOLS

NEWTON Hydraulic Cold Saw Machines are built in a range of designs of proved adaptability to handling all types of work in either ferrous or non-ferrous metals. Built in sizes to accommodate blades from 32″ to 120″ diameter.

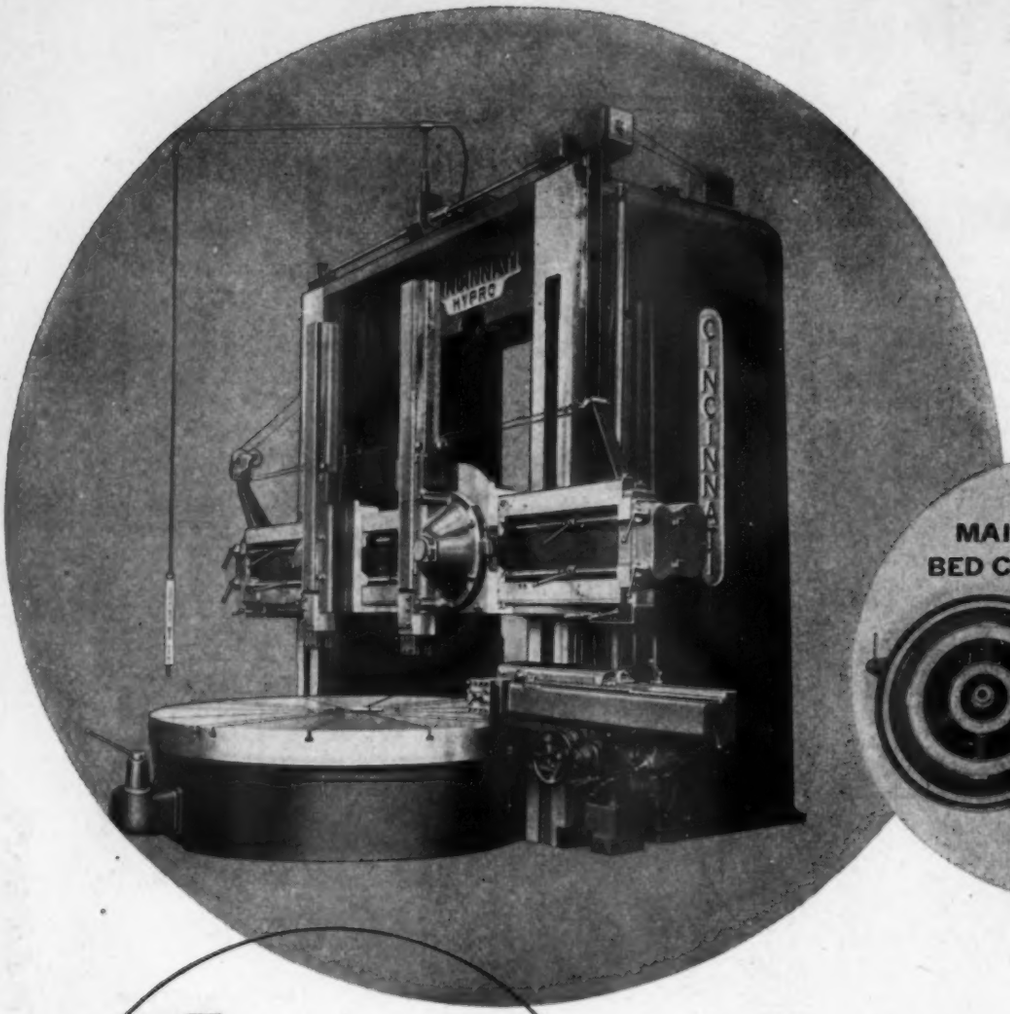
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

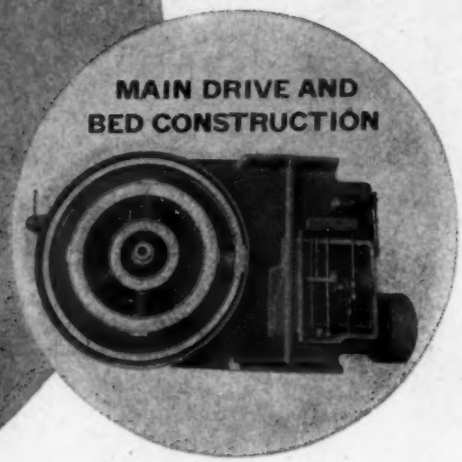
BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK





4 MORE GOOD REASONS FOR THEIR AMAZING PERFORMANCE

CINCINNATI HYPRO Boring Mill

10-FOOT — 12-FOOT

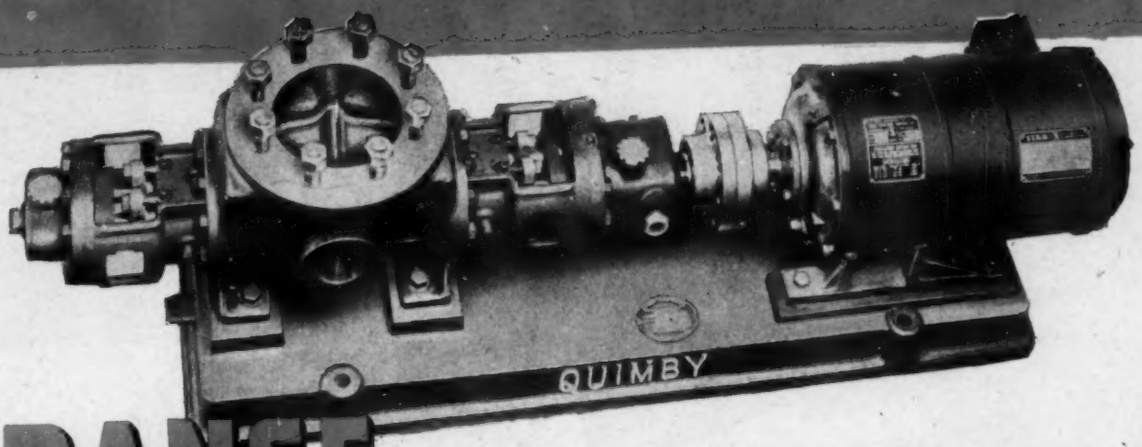
1. One piece speed box and bed construction, providing rigidity and preventing misalignment of shafts
2. Hardened steel forged gears mounted on multiple splined shafts running in anti-friction bearings
3. Anti-friction bearing table mounting with 3 load carrying tracks; outside track nearly full diameter of table
4. Automatic pressure lubrication to all units and parts, interlocked with main drive motor

THE CINCINNATI HYPRO PLANER COMPANY

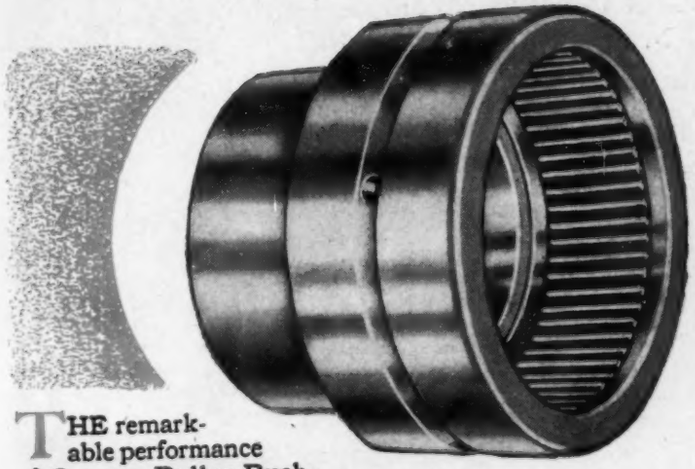
PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

Here's Precision Running!



ORANGE ROLLER BUSHINGS



THE remarkable performance of Orange Roller Bushings in Quimby Pumps is another example of their ability to stand up under high loads in small space.

The ruggedness of Orange Roller Bushings is due to precision design and manufacturing standards. Roller clearances are held to a minimum, providing closer running tolerances. This maintains alignment of rollers with the highly finished raceways, assuring even, quiet, cool running under severe stresses and heavy loads—with maximum life hours expectancy.

Whether your anti-friction problem is simple or complex, you get a practical low-cost solution when you install Orange Roller Bushings. Write today for our Engineering Data Book, showing full range of standard types and sizes.

maintain .004" screw clearance under heavy pumping loads in Quimby Screw Pumps

● In #2½ Quimby External Gear Hopper Type Screw Pumps, two parallel shafts of ⅞" dia. are spaced $1^{13}/_{16}$" apart. These shafts turn a quadruplicate set of screws which propel heavy, viscous fluids. A clearance of .004" on the diameter must be maintained to insure steady pumping and to prevent screws from touching body, which would cause galling. Only Orange Roller Bushings could meet all requirements in such close quarters. Their low vibration, high load carrying capacity and durable service have proved highly successful in these exacting installations for several years. Sizes 3, 3¼ and 3½ also use these bearings.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Roller Bushing Data Book.

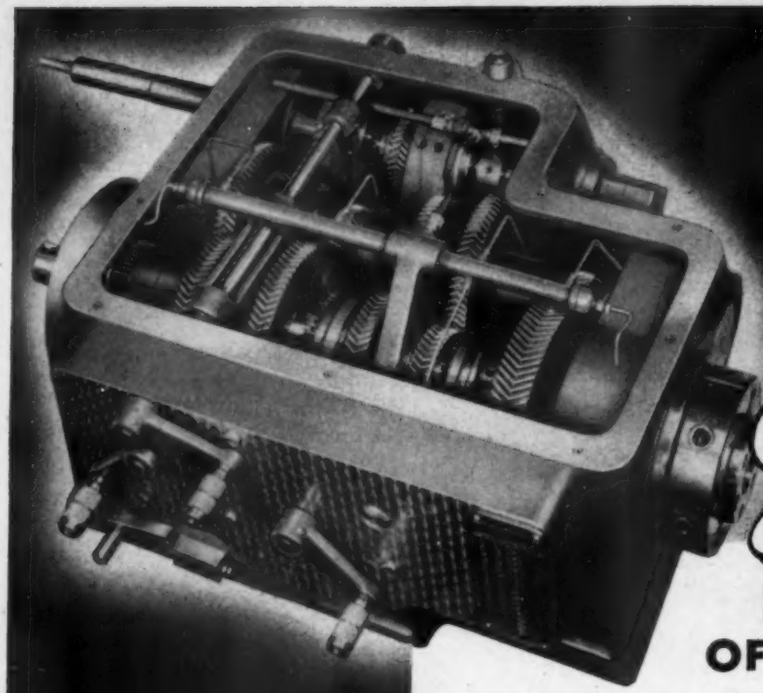
Name.....Title.....

Company.....

Address.....

City.....State.....

ORANGE ROLLER BEARING CO., INC.
554 Main Street, Orange, N. J.



Sidney Lathes

INCREASE LIFE OF CARBIDE TOOLS

The continuous tooth contact of Sidney's All-Herringbone Geared Headstock produces a smooth flow of power and creates pressure of constant intensity on the cutting tool . . . This constant pressure is especially desirable when using carbide tools by preventing tool breakage caused by shock or intermittent pressures.

●

Illustrated at Left

is the nature of contact between two mating herringbone gears. Pressure is evenly divided over three teeth with no tendency for tooth contour to wear unevenly. Full descriptive bulletin available.

●

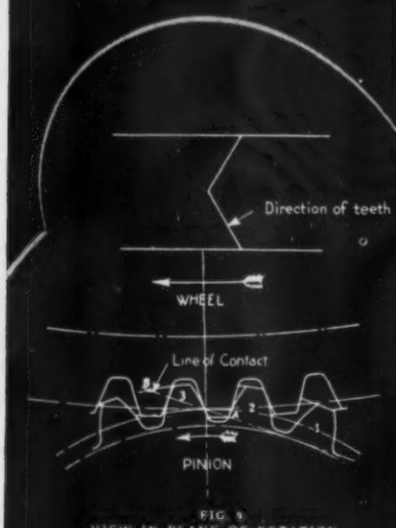


FIG. 9
VIEW IN PLANE OF ROTATION

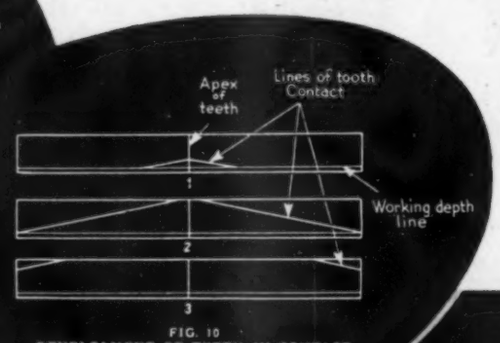
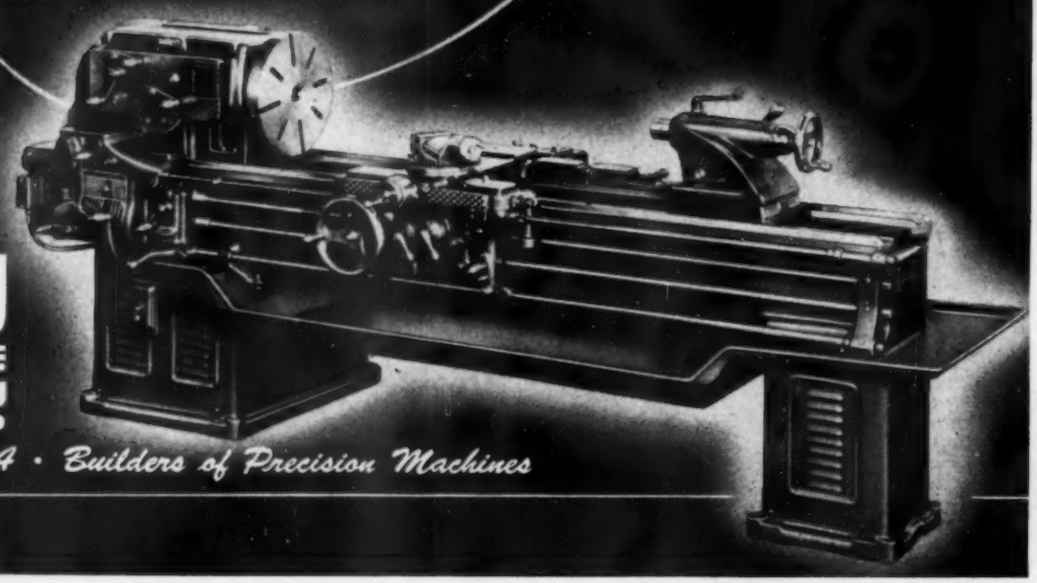


FIG. 10
DEVELOPMENT OF TEETH IN CONTACT.



THE SIDNEY MACHINE TOOL COMPANY
SIDNEY • OHIO

Established 1904 · Builders of Precision Machines

SIDNEY

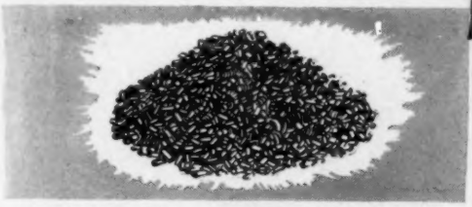
POUND FOR POUND...

...get 3 times as many finished parts!

HIGHER SPEEDS

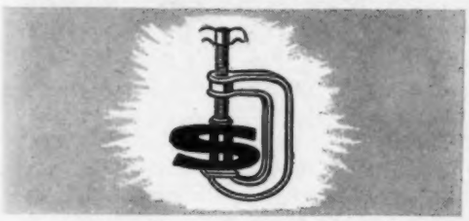
R317-T can be run at high-profit speeds, comparable or in some cases, higher speeds than brass.

CLOSER TOLERANCES



R317-T machines easily to a bright, natural finish. Forms small chips. Does not run with the tool. May be worked to very close limits.

LOWER-COST MACHINING



Accurate volume production with fewer rejects. Result: lower cost, more profit per finished part.

Yes—thanks to the favorable weight factor aluminum gives you three times as many finished parts per pound as brass.

By the foot you pay less for aluminum than you do for brass. All of which adds up to a saving of about 50% in material cost.

For high speeds, excellent machinability, a bright, natural machine finish and LOWER COSTS, use R317-T, Reynolds new aluminum screw machine stock. Only a fraction of the cost per finished piece as R317-T weighs only ⅓ as much as brass (and other heavy nonferrous metals).

Order now. R317-T is ready for immediate shipment from Louisville warehouse stock in rounds and hexagons in all standard sizes. 17S-T, Reynolds standard screw machine stock, is also available now.

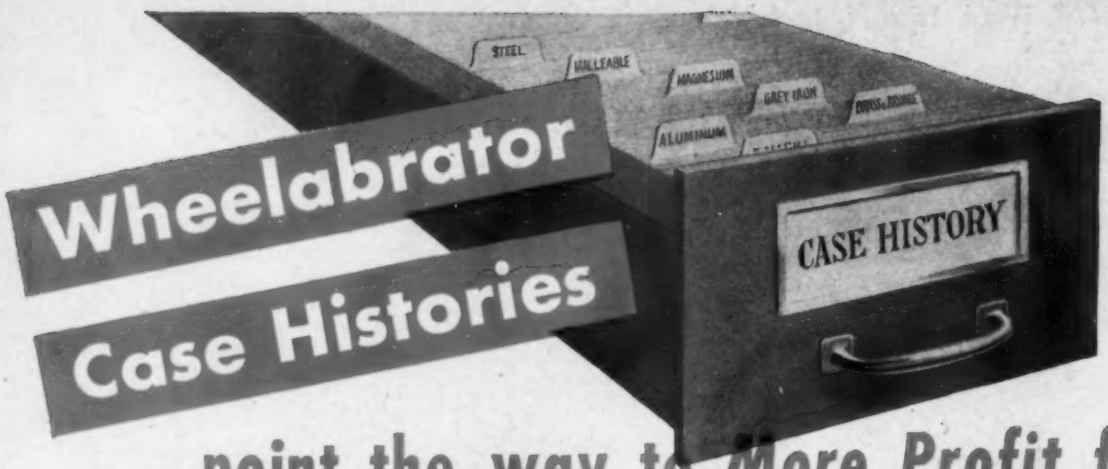
Consult Reynolds. Reynolds is ready to work with your engineers. Offices in principal cities. Phone nearest office . . . or write Reynolds Metals Company, Aluminum Division, 2523 South Third Street, Louisville 1, Kentucky. See Sweet's or write for Catalog 100-B "Reynolds Aluminum—Available now for Today's Products."

REYNOLDS METALS

REYNOLDS ALUMINUM

The Great New Source of

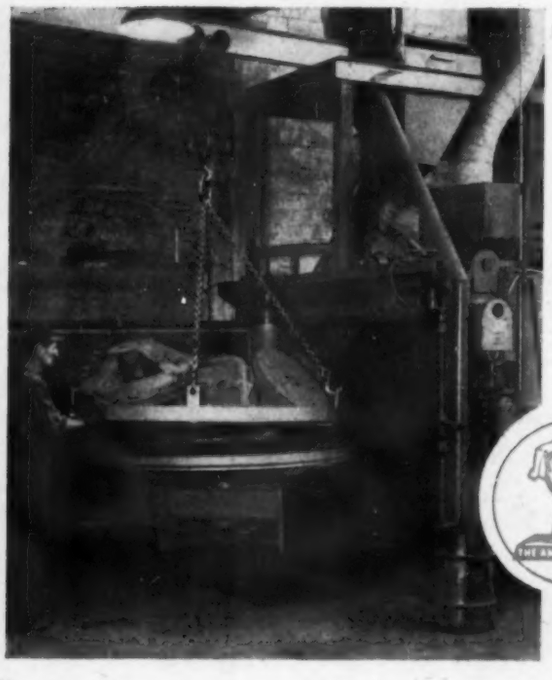
INGOT · SHEET · SHAPES · WIRE · ROD · BAR · TUBING · PARTS · FORGINGS · CASTINGS · FOIL · POWDER



Wheelabrator Case Histories point the way to More Profit for you

Read these typical case histories of Wheelabrator's profit-making performance and see how widely it is being applied to casting cleaning problems of all kinds. Then let us show you by actual demonstration what the Wheelabrator will do on your own products. We believe you will be agreeably surprised at the all-'round savings it will effect for you.

72" dia. Wheelabrator Swing Table used by H. R. Deuscher Co., Hamilton, Ohio



Swing Table Eliminates Airblast Room and Ten Tumbling Mills

The Western Land Roller Co., Hastings, Nebraska, is using a 66" diameter Swing Table to clean 3 ft. x 4 ft. side frames, pump castings for irrigation pumps and other miscellaneous castings. They formerly used 12 rattling mills and a sand blast room to do this work. They are now running from 10 to 14 tons of grey iron on this table in from 6 to 8 hours.

Wheelabrator Pays for Itself in Savings

A saving of $23.60 per day resulted by replacing tumbling mills with a Wheelabrator Plain Table at a large Cleveland jobbing foundry. Faster shipments, reduced storage space, and lower handling expenses were also reported.

Wheelabrator Saves $5,853.96 in Five Months

On one type of casting alone the New York Air Brake Co., Watertown, N. Y. saved $5,853.96 with a Wheelabrator Cabinet during the first five months' operation. The per-casting cleaning cost of this piece by tumbling was 42.6c and only 26.5c by Wheelabrating. This saving of 16.1c applied to a total of 36,360 castings.

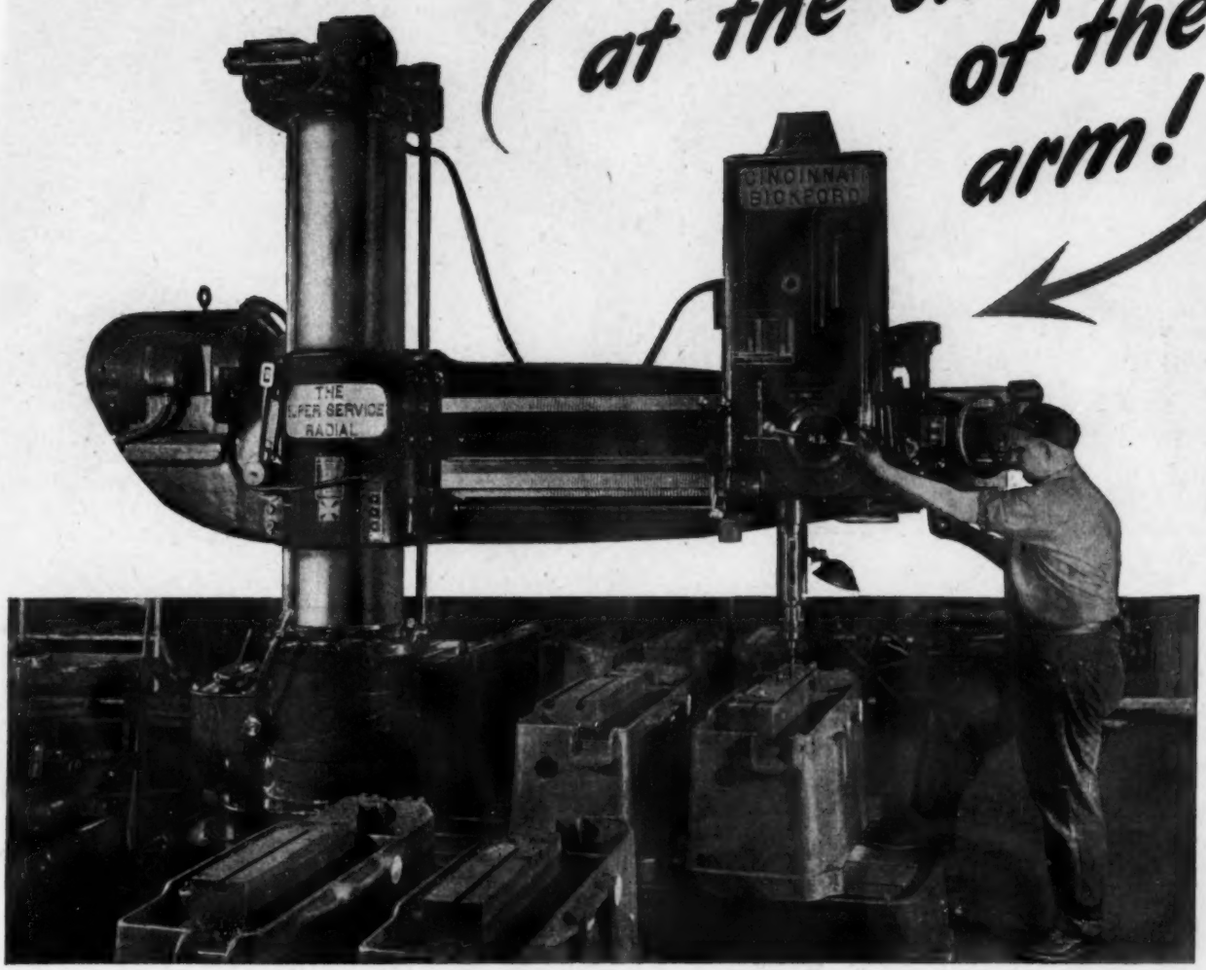
One Man does the Work of Six

Prior to the installation of a 48" x 42" Wheelabrator Tumblast the Texas Steel Co., Fort Worth, operated a sandblast room 7 days a week, 24 hours a day. Six sandblast operators were needed. Now, the sandblast room, using one operator, handles only castings too large for the Tumblast. All other castings are Wheelabrated in eight hours.

American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
317 S. Byrkit St., Mishawaka, Indiana

ACCURATE...

at the end of the arm!



Long bearing surface on the sturdy column and rigidity of the arm, plus the triple gibbed head mounting on arm, on Cincinnati Bickford Super Service Radial Drills insure accurate work even when the head is in extreme position at end of the arm.

Here setting up two castings at a time, and the convenient location of all control levers low on the job are speeding the job.

The machine answers easily to the touch of the operator—he spends less time on manipulation and more on production.

Write for Bulletin R-24A.

See our condensed catalog in Sweet's File.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

Danly Die Sets and Die Makers' Supplies Speed Production

in the Die Shop

in the Press Room

DANLY PRECISION DOWEL PINS are accurate through their entire length . . . Diamond tested for hardness (58-60 Rockwell-C) . . . Ground to a tolerance of .0001".

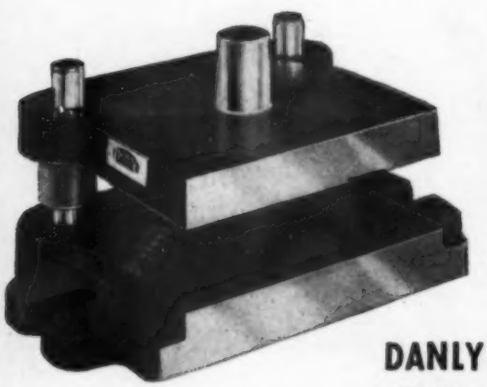
Photo—Courtesy of Croname, Inc.

DANLY KNURLED SOCKET-HEAD CAP SCREWS save time and money. The mechanic can drive the knurled head a good part of the way before using the wrench. Infinite applications—a wide range of sizes.

DANLY KWIK-KLAMP TOGGLE CLAMPS combine strong construction and simplicity of operation—used wherever quick, positive clamping action is required.

DANLY DIE SPRINGS are noted for staying power and high resistance to fatigue. Two complete lines: *Medium Pressure—High Deflection; High Pressure—Medium Deflection.*

DANLY SOCKET-HEAD STRIPPER BOLTS. Made of high-grade steel, these stripper bolts have the same knurled socket-head found in Danly Cap Screws.



DANLY DIE SETS are famed for precision and known accuracy in Die Shops and Stamping Plants everywhere. Many types and sizes in Steel, and Semi-Steel.

DANLY *National Assembly*

Call Danly

- **MILWAUKEE 2** — 111 East Wisconsin
- **DETROIT 16** — 1549 Temple Avenue
- **CLEVELAND 14** — 1850 East 33rd Street
- **DAYTON 2** — 990 East Monument
- **ROCHESTER 4** — 16 Commercial Street
- **PHILADELPHIA 44** — 18 W. Chelten Avenue
- **LONG ISLAND CITY 1** — 47-28 37th Street
- **DUCOMMUN METALS & SUPPLY CO.** — 4890 South Alameda, Los Angeles 58

DANLY MACHINE SPECIALTIES, INC.

2100 South 52nd Avenue • Chicago 50, Illinois

Danly Tool, Die and Gage Makers' Supplies

American Machinist's Spot NEWS OF METALWORKING

U. S. warships will be propelled by atomic energy, probably within five years, states Vice Admiral Earl W. Mills. No important design changes of boilers and turbine power plants will be necessary. Essentially, an atom pile will be substituted for oil heat.

Machine tools sent to Greece by WAA should be ready for immediate operation, states Tell Berna, general manager, National Machine Tool Builders' Association. There is no point in shipping surplus machines in present emergency if they must be taken apart, cleaned, repaired and perhaps repair parts ordered after they are delivered to Greek shops.

Department of Labor is likely to be little more than a statistics-gathering agency when Congress completes legislation and appropriations. Even so, some important studies will have to be discontinued, including direct productivity reports recently initiated.

Two midwest metalworking companies have installed incentive pay plans based on management's setting aside a specified percentage of each day's dollar shipments of products for division among employees later on. These plans are reported stimulating employees' interest in higher productivity.

Freight car situation is getting worse, with production of new cars only 2300 a month (February figure) compared with a retirement rate around 5600. Washington wants car-building boosted to 10,000 monthly. At last count, accumulation of car orders totaled 91,000 units.

Italian machine tool builders as well as British are competing with U. S. manufacturers for Latin American business. Italian machines are far inferior in quality, the heavier types weigh about 30% of ours, prices are 60-70% of U. S. prices. Argentina is in market for large numbers of machine tools for armed forces, schools and port authority.

> Flash from Berlin: Limited output of iron and steel in Germany has necessitated providing spare parts ahead of new machinery in all German industries. To incredible extent, problem has been met by cannibalizing damaged equipment or surplus machines. Manufacturers in neighboring countries with German equipment are feeling pinch of being unable to secure replacement parts.

Around 166 million lb. of brass battle scrap came into this country for reuse during 1946. Little more is expected because of transportation difficulties and because it will be reused in the areas where it has been reclaimed.

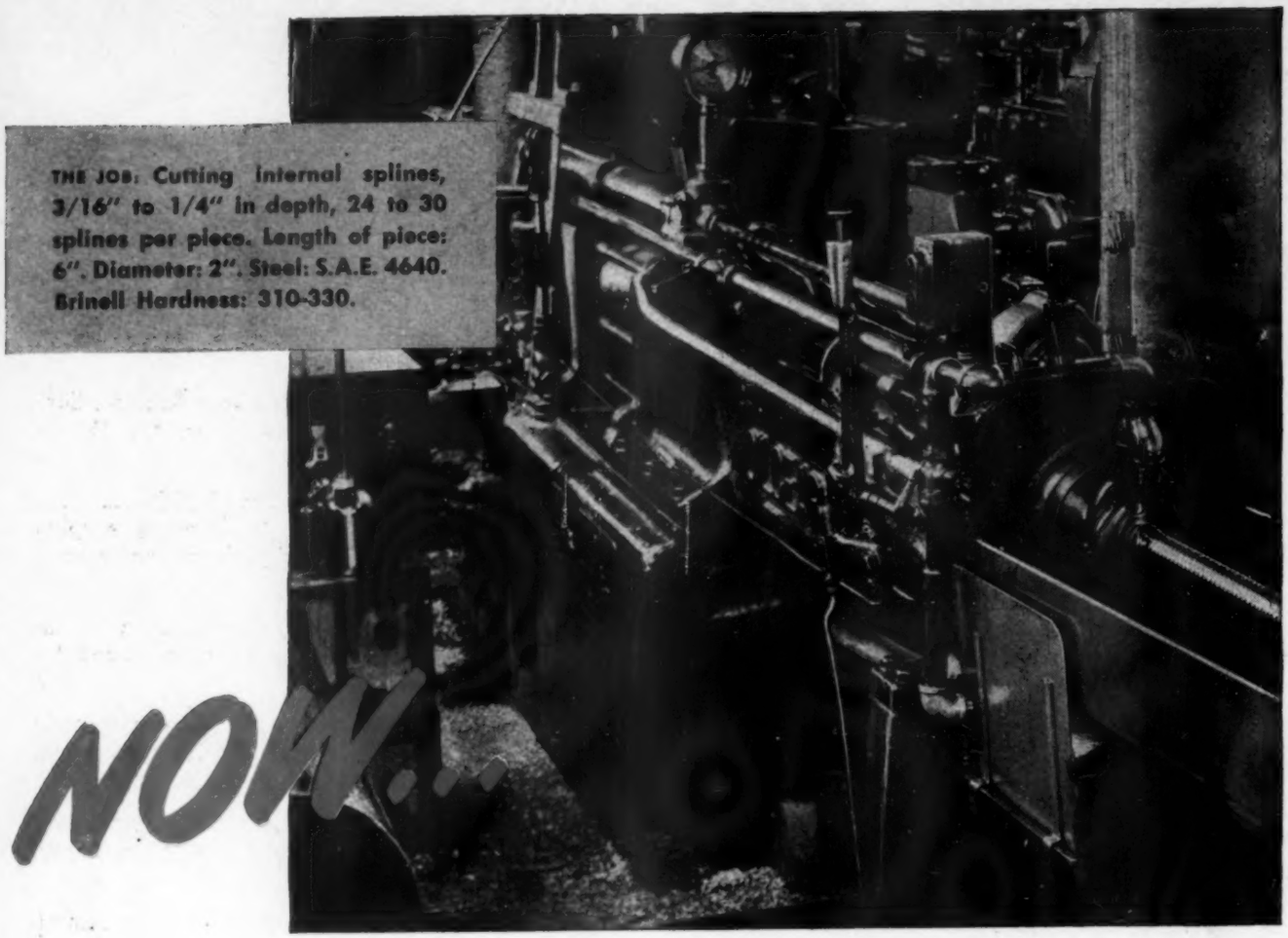
First 25-30 hand-built models of Tucker Torpedo car will go on display in June, with production starting during July. Only one model will be made at first, weighing 2700 lb. and selling for $1885 at Chicago. Tucker expects to employ a large number of tool engineers and designers soon.

RFC expects to sell or declare surplus by July 1 all of its machine tool holdings, except those under interim lease to contractors at Army and Navy request (about $25 million worth). It now holds some $250 million worth of machines, half of which are in its own plants currently being declared surplus. From V-J Day to Feb. 28 this year, it sold 35,637 units located in private plants.

Bogging down of home building program has forced curtailment of operations by boiler manufacturers and their suppliers. In some cases companies are embarrassed by inventories of home boiler units.

Automobile engine rebuilding programs, which are in response to a huge retail demand for rebuilt motors, are being seriously hampered by shortages of cast iron parts, particularly crankshafts and valves made of special alloy steel.

General Motors is to enlarge its facilities for making castings by building a malleable iron foundry at Danville, Ill., and a gray iron foundry at Defiance, O. GM's foundry division already operates foundries in Lockport, N. Y., Saginaw, Mich. and Danville.


THE JOB: Cutting internal splines, 3/16" to 1/4" in depth, 24 to 30 splines per piece. Length of piece: 6". Diameter: 2". Steel: S.A.E. 4640. Brinell Hardness: 310-330.
NOW...

BROACHES LAST 50% LONGER

THIS job offers a good example of how Texaco Products and Lubrication Engineering Service are helping industry everywhere improve products and reduce costs.

With the competitive cutting oil previously used, frequent re-grinding of broaches was necessary and great difficulty was encountered in maintaining size. On the recommendation of a Texaco Lubrication Engineer, *Sultex Cutting Oil B* was adopted. *Broach life immediately increased 50% and size difficulties were eliminated.*

Texaco Sultex Cutting Oil B is one of a whole family of Texaco cutting coolants designed to help machine all metals better, faster, at lower cost. These famous oils cool as they lubricate . . . prevent chip welding and wheel loading . . . assure more cuts per tool grind and improved finish . . . reduce rejects.

Call on Texaco Lubrication Engineering Service for assistance in selecting and using the right lubricants to give you these cost-saving benefits. Contact the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write The Texas Company, 135 E. 42nd St., N. Y. 17, N. Y.

TEXACO

TEXACO CUTTING, SOLUBLE AND GRINDING OILS FOR FASTER MACHINING

Tune in . . . TEXACO STAR THEATRE presents the NEW TONY MARTIN SHOW every Sunday night. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Creative Selling

Selling from now on will be one of management's most important functions.

That is why so much interest is being shown by so many industrial equipment builders in training future salesmen.

Selling techniques, like production processes, are constantly being improved. Yesterday's standards are outmoded and today's requirements are much stiffer.

No longer is a good salesman primarily a glad-hander, who goes a long way toward securing the desired business by wining and dining his customers.

He is expected to be a sales engineer instead. And the title "sales engineer" is not just a fancy name for the same old salesman.

Distributors as well as manufacturers are now insisting upon new salesmen having college or practical engineering experience. They are put through a rigorous training routine at the factory and in classes.

These salesmen must have a thorough knowledge not only of the product which they intend to sell, but also of their customers' production problems.

That is where creative selling comes in. A user is not going to buy a new machine merely because it incorporates a lot of new features.

He must be shown conclusively that he can increase productivity in his plant or improve the quality of his product, or both, by installing the new machine.

A new and legitimate want is thereby created. And the machine will have been sold for what it will do, not for what it is in itself.

We already have reached the stage of a balance of supply and demand in many industrial equipment items. Henceforth vigorous, aggressive selling will be necessary if plants are to be kept busy.

The time is ripe, therefore, for the employment of men with the best all-round training to do the big job looming ahead.

It is particularly appropriate that one of the country's great engineering schools—Purdue University—has recognized the need for sales engineers by providing a course in that subject. Other engineering institutions should do the same thing.

Too many equipment builders have relied upon their product to sell itself. They have sat back and waited for orders to come in.

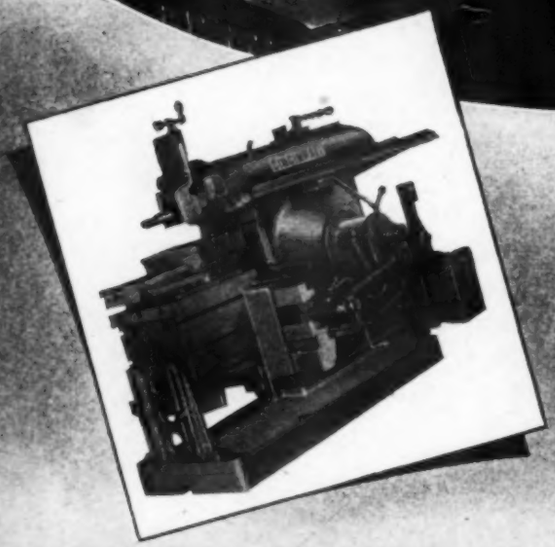
That kind of inaction won't work any longer. It may have been all right in wartime, when every shop was bulging with business, but it means defeat in a highly competitive market such as we are now entering.

Sales engineering should be given its proper place in the scheme of things. It should be among the top-ranking activities of management.

Burnham Finney

EDITOR

THEY ARE *dependable-*



They never stop—fair weather or foul—day and night the iron horse rolls, delivering the goods of a nation—they are dependable.

Behind the scenes, men and machines work to keep the iron horse healthy.

Cincinnati Shapers—rugged, sturdy and versatile—work in Railroad Shops from coast to coast—they are dependable.

Write for Complete Shaper Catalog N-3.

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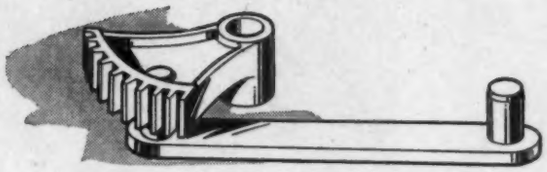
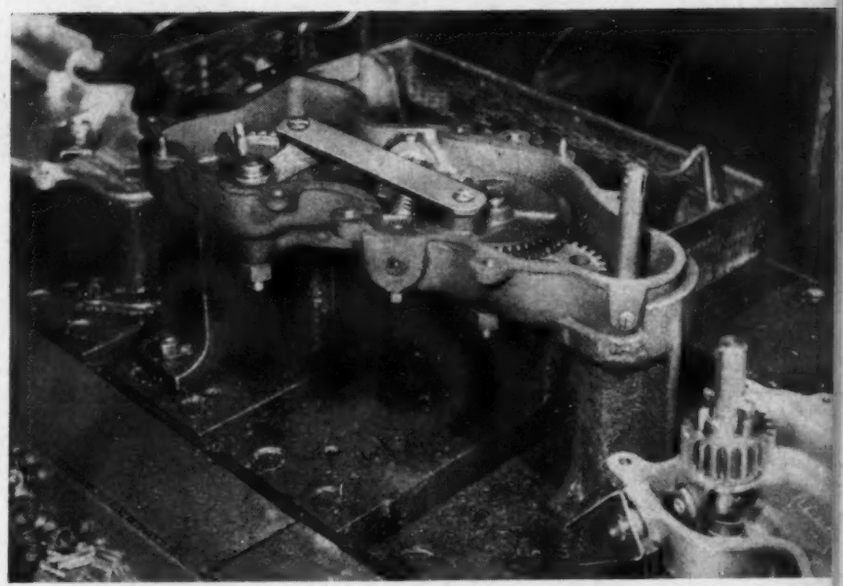


Novel Tools Cut Cost of Gear Sector

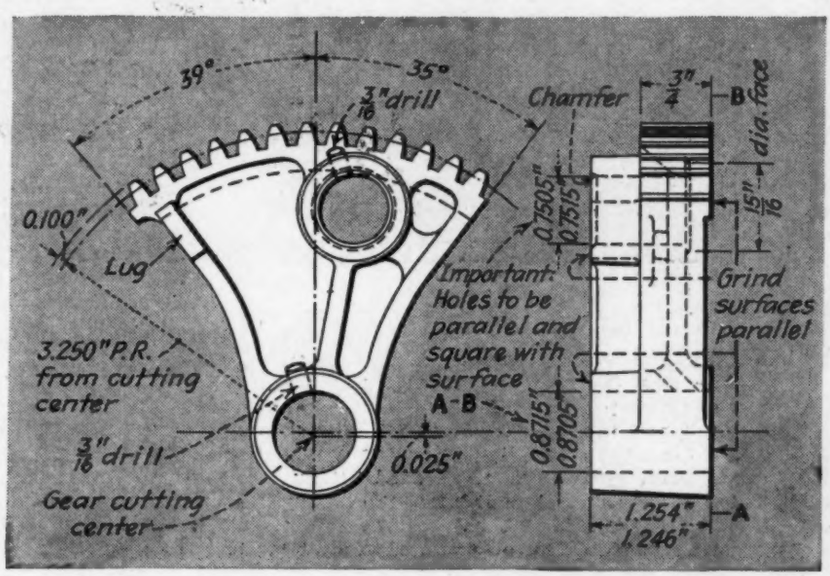
By KENNETH F. BROOKS
MASTER MECHANIC
NINETEEN HUNDRED CORPORATION

WE MUST machine nearly 2,000 close-grain iron gear-sector castings each day for drive-gear boxes of domestic washing machines. Only five machining and one subassembly operations are necessary to prepare these 1½-lb. castings for delivery to the assembly line.

Machines are arranged so parts can be transferred between machines in lift-truck tote boxes, or moved by hand in small tote pans. Except for the Kingsbury drilling and reaming machine, all machines in this group are general-purpose units, special tooling being employed to increase machining efficiency. Insofar as possible, productive capacity of each unit is balanced with that of the rest of the line to prevent piling up of semi-finished parts between operations.



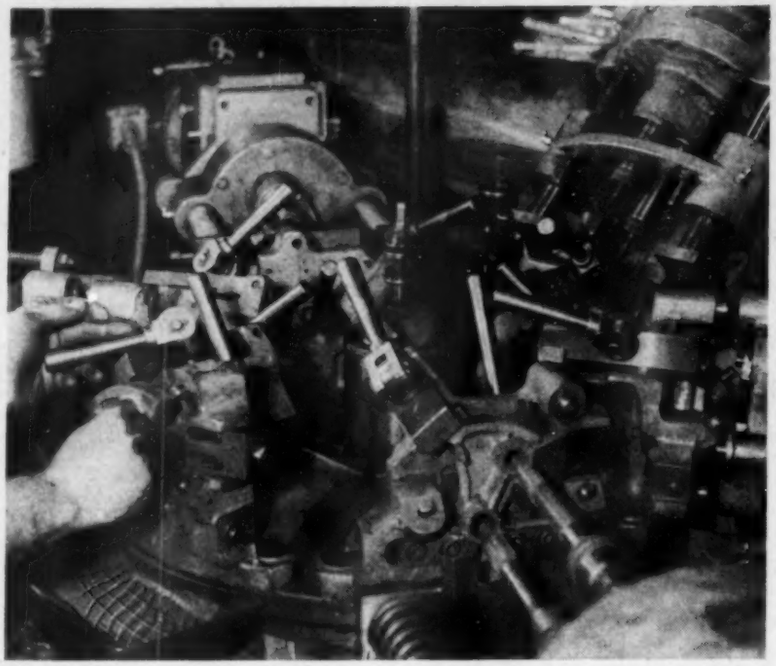
CAST-IRON GEAR SECTOR in this gearbox is reciprocated by adjacent worm wheel to which it is connected by a pinned strap. The sector drives vertical agitator shaft mounted in gearbox cover. The box is assembled on this slat-type constantly moving conveyer having support blocks to hold case and cover castings



Gear-sector castings are annealed before delivery to the machining group. There are 13 full teeth cut on the sector; these teeth are 10 diametral pitch, 20° involute and are cut with a pitch radius of 3.250 in. which is 0.025 in. eccentric from the pivot-hole center. This produces a pitch radius having 0.005 in. greater distance from the pivot-hole center at each end of the sector than at the centerline. Sector is cut eccentric so there will be normal backlash at center of sector when assembled with the gear on the agitator shaft, but teeth will bind when sector is rotated to either side. Noise at reversal of agitator shaft thus is eliminated

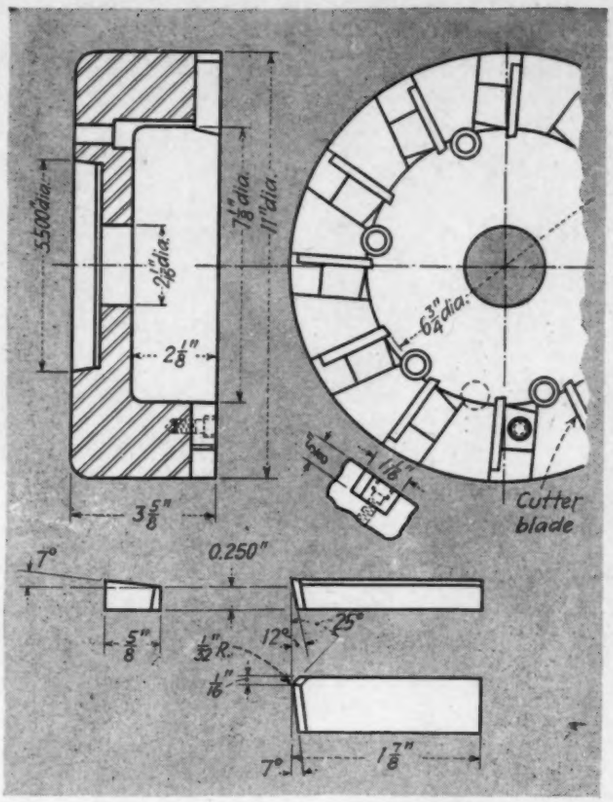
1.. Opposite faces of gear-sector castings are ground parallel in a Blanchard surface grinder. 65 castings are held on the magnetic table in each grinding cycle. After one side is ground, castings are dipped in nearby tank of soluble-oil solution to remove grinding sludge, then replaced for finishing opposite side. Thickness must be held to 1.246-1.254 in. Production averages 1,700 pieces ground on both sides in 8-hr. shift. A lug cast on pad face of sector prevents tilting when this face is down

2.. Following each grinding cycle, sector castings are piled in small wire baskets for dipping in tank of soluble-oil solution to remove grinding sludge. This tank is adjacent to the surface grinder, and has a tray on which the basket can be placed while the operator is busy at the machine

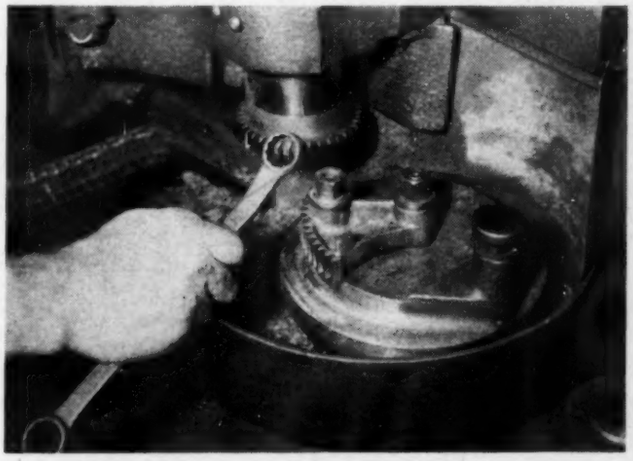


3.. Four holes are drilled and two are rough and finish reamed in a multiple-station Kingsbury machine. Production averages 175 pieces per hour or about 1,500 pieces during each 8-hr. shift. Automatic indexing table has six stations. The 0.8705-0.8715 in. dia. pivot hole and the 0.7505-0.7515 in. dia. connecting-rod pin hole must be parallel and square with the bottom face of the casting. Fixtures have cam-type quick-acting clamps which hold the castings against hardened steel buttons

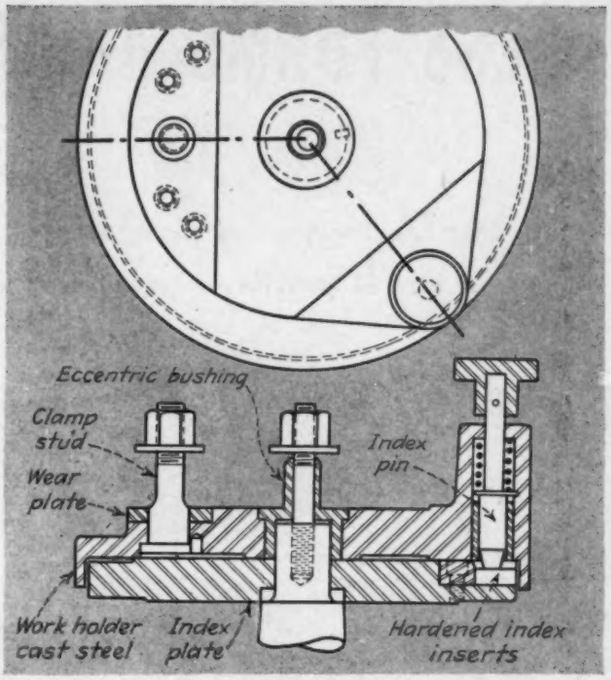
4.. After spotfacing under the connecting-rod pin hole, castings are delivered to a No. 4 Gisholt turret lathe where the 3.350-in. radius, ¾-in. wide gear face is hollow-milled in this unusual setup. Production is about 800 per shift from each machine. Cutting speed is 300 rpm., feed 0.005 in. per rev. Cutter is enclosed with a sheet-metal guard. Workholding fixtures are mounted on the six faces of the turret, and forward movement of turret feeds the casting into the cutter mounted on the lathe spindle. Fixtures locate pieces from the ground bottom face and two large reamed holes. Hardened steel studs locate the casting. Pin on which pivot hole of casting is placed is 0.025 in. eccentric so surface cut is 0.005 in. further from pivot-hole center at each end than at center



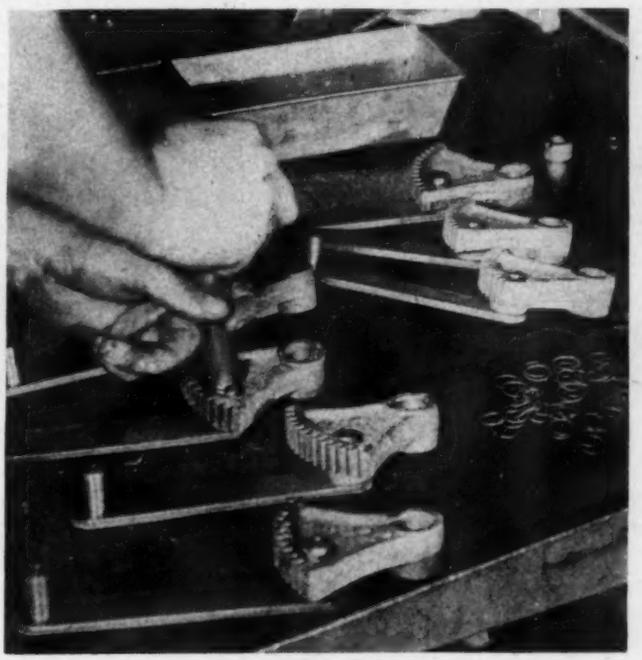
5.. Made from low-carbon steel, body for hollow mill is designed to fit standard spindle nose of turret lathe. It holds 12 solid Kennametal M-A-6 carbide or cast Tantung alloy cutting blades at 5° positive radial rake and 7° axial rake. Top surface of blade is ground at 7° side rake, so when assembled it has a 7° axial rake. Standard Kennametal jack-lock assemblies are employed. Diameter turned with this hollow-mill cutter ranges from about 6¼ to 6¾ in. Blades are positioned easily with a dial indicator



6.. Sector gear teeth are cut in standard No. 7-A Fellows gear shapers placed in pairs on opposite side of a narrow aisle so one man can operate two machines efficiently. With this special workholding table fixture, production averages about 300 sectors per machine during an 8-hr. shift. The 4-in. dia. cutter is operated at 780 strokes per minute. Production per gear shaper would be much less if workholding table made a full revolution for each sector cut. Instead, an indexing fixture has been mounted on the table so a cut sector can be removed, another sector mounted and the upper plate of the fixture indexed clockwise 120°. Each cycle is set for 120° counter-clockwise traverse of table



7.. The 8 1/16-in. dia. indexing work holder for the gear shaper is counterbored to fit over the 7⅝-in. dia. index plate on the work spindle of the machine. Inset into this plate are three hardened tool-steel locator grooves into which is locked the spring-loaded, hardened toolsteel index pin. Center stud on workholding plate has a bushing set 0.025 in. eccentric to produce a pitch radius 0.005 in. greater from the pivot-hole center at each end of the sector than at its center line. A hardened tool-steel plate is set into top fixture casting to reduce wear

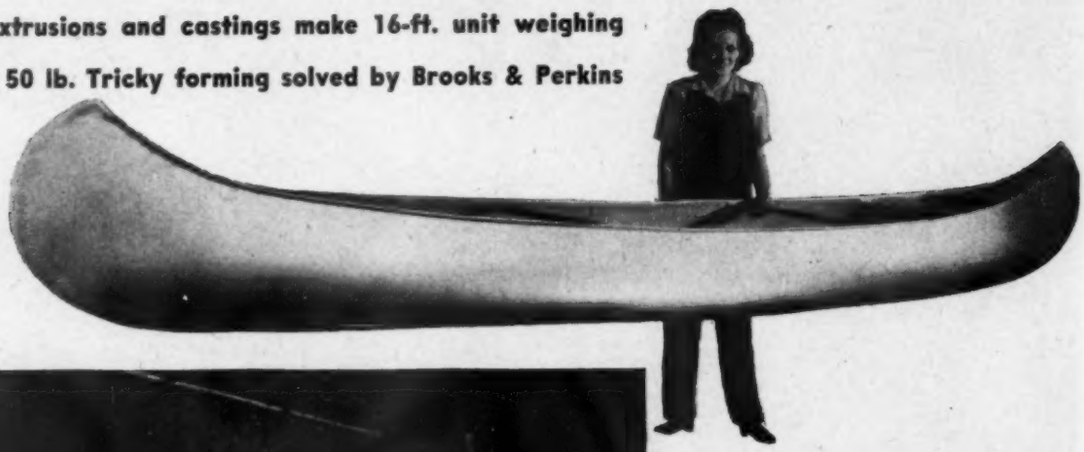


8.. Final operation on gear sector is to insert a grooved stud in one end of connecting rod in 0.7505-0.7515 in. reamed hole in the sector, then a spring snap ring is assembled in the groove of the pin to hold subassembly together. One man performs this operation at average rate of about 240 pieces per hour. Finished sub-assemblies are placed on bench in front of operator, from which they are secured for final assembly

PRESS FORMS 4-PART MAGNESIUM CANOE

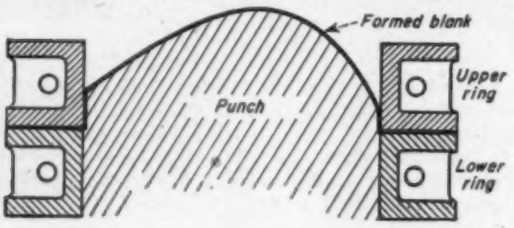
BY CHESTER S. RICKER DETROIT EDITOR

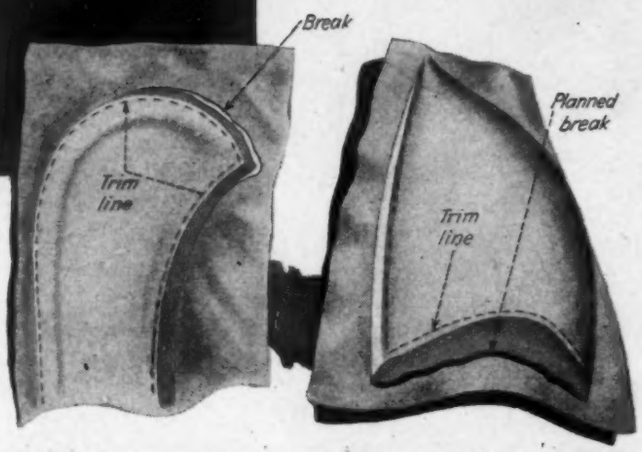
Sheets, extrusions and castings make 16-ft. unit weighing less than 50 lb. Tricky forming solved by Brooks & Perkins



1. FEATHERWEIGHT TRANSPORTATION . . . This 16-ft. canoe, of Dow "Ma" alloy, has 34-in. beam and about 1 ft. freeboard. Produced by Brooks & Perkins, Detroit, for the Specialty Products Div., Dow Chemical Co., it can support itself and two occupants capsized. Here the canoe is ready for priming with zinc chromate (Navy spec.) and enameling (light gray Dulux striped with deep green outside and green-decked with heavy non-skid paint inside). Enamel drying is accelerated in an infrared oven through which the canoe passes on a monorail conveyor

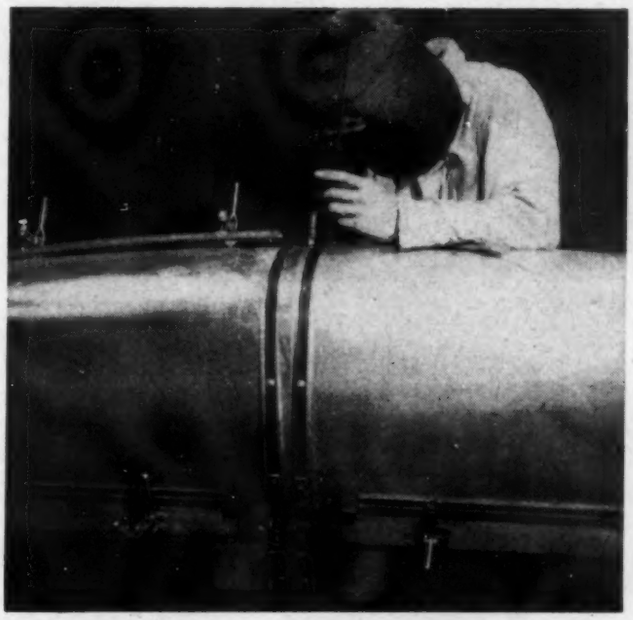
2. FORMING . . . Sheet 0.051 in. thick is formed in a 750-ton hydraulic press. The lower die, largest thus far made for magnesium, is the male, the upper simply a container ring. Both are nickel-iron castings. Upper and lower die rings (sketch below) are heated by open gas flames from ¾-in. pipe attached to their sides. Gas and compressed air are mixed in the line for maximum heating—vital to hold rings at 625 F.



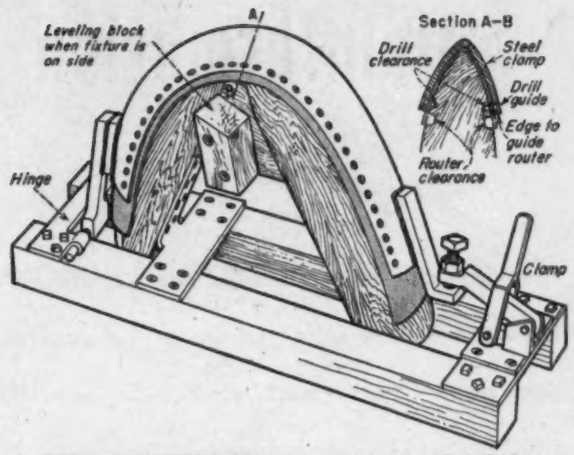


3. FORMING DETAILS . . . To get true contours at the center-section end of the canoe skin (right sketch), and at the end (left sketch), the sheet edges must provide metal for clamping during drawing. Although blanks are heated in a box-type gas-fired oven to 625 F. and checked by hand pyrometer as they enter the press, they frequently break at the draw line. This causes no trouble because the break is well outside trim lines. This also eliminates wrinkles in the used area

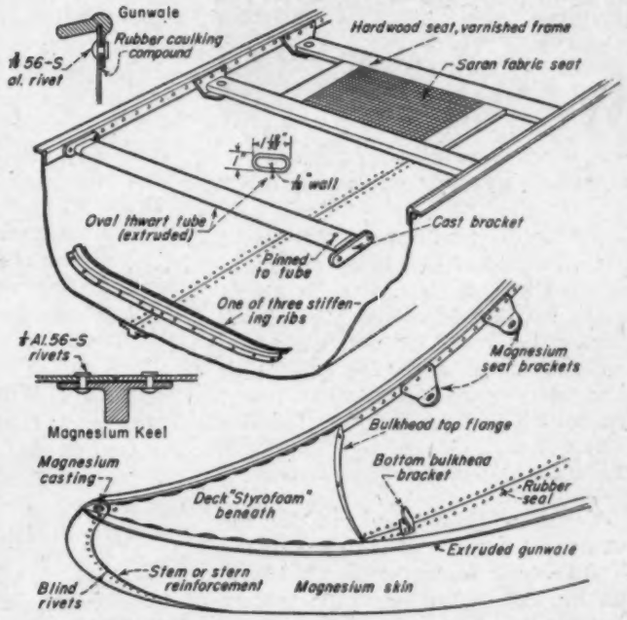
4. TRIMMING TO SIZE . . . Four quarter skins, two rights and two lefts, make up the canoe. Drawn sheets are marked to templet and then bandsawed to contour as were these sections ready for cleaning. Colloidal graphite is sprayed over both sides of the flat sheet before it is placed in the die to prevent scuffing as it is drawn through pressure plates and possible sticking in the die. Graphite must be removed before finishing by dipping in chromic-acid solution, thorough hand brushing, then rinsing in cold and hot water in turn. Cleaned skins are chrome-pickled (No. 1 Dow treatment) for protection during assembly operations



5. WELDING . . . Two trimmed skins, a left and a right, are butted and clamped together in a heavy wooden fixture and Heliarc-welded. The inside bead is left, but the outside one is dressed off and the joint polished. Simple tooling here and elsewhere is possible because production is only four or five canoes an hour under present conditions



6. END REINFORCING . . . V-shaped reinforcements are formed and drilled in a maple fixture. The ⅛-in. steel cover strap, formed to desired contour, clamps the magnesium strip into the fixture and acts as a drill plate and router guide. Holes are large enough to take a guide bushing for No. 40 drilling of rivet holes. Blocks on either side hold the fixture level when it is on its side for routing sides of piece



7. ASSEMBLY . . . Two oval thwart tubes brace extruded gunwales (top left) near the center. Cast brackets, pressed into and pinned to tubes, are riveted to gunwales, which in turn are riveted to the skin through multiple-punched No. 40 holes. Hat-type bottom-stiffening ribs and decks are formed over male dies in a rubber-pad hydraulic press. Decks, compound-curved and flanged on three sides, are scalloped so they are attached to gunwales only by alternate rivets. Scalloping permits compound curvature to be obtained more easily. Beneath the deck and behind a bolted-in bulkhead (not shown) are cakes of Styrofoam, the airblown polystyrene 10 times as buoyant as cork. V-shaped stem and stern reinforcements tie the two sides together and terminate in cast painter rings (for mooring). Bottom ribs of keels are routed off at ends to come flush with end reinforcements. All joints are sealed with 3-M rubber caulking compound. Seats are Saran plastic, water-resistant and mildewproof, stretched over varnished hardwood frames attached to gunwale brackets

Misinformation Please

By JOSIAH DAVIES, OSHAWA, ONTARIO

The "boners" of schoolboys are not all in history or geography. These examples, collected by a technical instructor from apprentice papers, will curl your hair and tickle your funnybone.

"There are three kinds of taps: water taps, gas taps and laundry taps."

APRIL 1 is traditionally All Fool's Day, but foolishness is by no means limited to that date. Here is a collection of schoolboy "howlers," which, believe it or not, are taken as written in first-year papers at the elementary technical training school where I am an instructor. Before you laugh too loudly, think back to what you might have written.

Question: How would you find the center of a piece of round stock?

Answer 1: Draw two parallel lines on the end of the stock. The center is the place where the lines cross.

Answer 2: Put a piece of string round the outside of your job, then cut the string into two equal parts. The length of one piece of string will be the radius, from which you may find the center.

Answer 3: You find the center of round stock by a piece of string and a pencil tied to one end.

Safety First Gems

Don't monkey with a lathe dog while it is running.

Don't pick up anything that is too heavy for you to lift.

Don't pick up a piece of hot steel from the floor.

Don't try to drill without having something under your work.

Don't leave your tools anywhere.

Don't hit your hand with a hammer.

Don't screw your hand up in the vise with the job.

To avoid getting sparks in your eye, don't let your work touch the emery wheel.

Don't put a right-hand nut on the emery-wheel spindle when it should be a left-hand one. If you do, the wheel will fly off and knock your block off.

Don't let your hair get caught in the drilling machine.

If you don't watch out, the piece being drilled woils up to the top of the bit, then woils down and flies into space.

Question: What is a blind hole?

Answer 1: A blind hole is one that you cannot see.

Answer 2: A blind hole is one that has no end.

Answer 3: You cannot tap a blind hole.

Question: How is a live-center adjusted when it is out of true?

Answer 1: When a live-center is out of true, loosen one jaw and tighten the other.

Answer 2: Give it a wallop with a hammer.

Lowdown on Mandrels

The essential features and uses of mandrels are:

They should be different sizes.

They should be tapered one thousandth of an inch to the square inch.

They are used to turn hardened steel.

They are used to thread the inside of a hole.

They are used to enlarge a hole.

Tap Tips

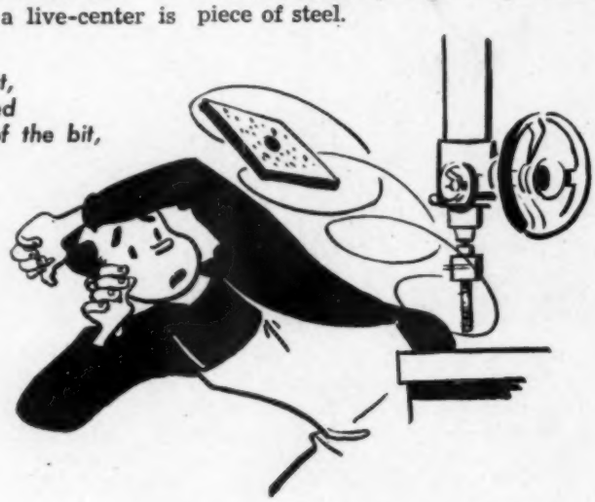
There are three kinds of taps: water taps, gas taps and laundry taps. A tap is used to measure the depth of a hole.

Taps are used for making holes. Tapping a hole makes it smaller.

Question: If the tapered portion of a tapered-shank drill was too small for the tapered socket of the drill spindle, what would you do about it?

Answer 1: I would put splints around the drill, or pack up with a piece of steel.

"If you don't watch out, the piece being drilled woils up to the top of the bit, then woils down and flies into space."



Answer 2: Put a piece of pipe around the steel.

Answer 3: I would make another hole the right size in the drill spindle.

There are three kinds of reamers: tapered reamers, reamers that ain't tapered and reamers that won't cut.

Original Answers

Here are a few original ideas of the students (It is not necessary to repeat the questions; the answer in each case suggests what the question was):

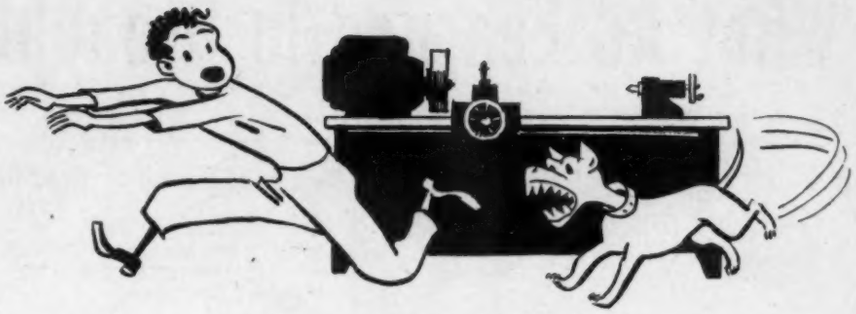
When your work wobbles, tighten up the belt. If your work doesn't run true, keep turning it round until it is true.

The reason for centering a piece of work is to make a hole to put in cutting compound.

If you drill a hole in the wrong place, you can't rub it out.

If after centering a piece of work for the lathe it does not run true, cut a short piece off with the hack saw to take out the center, and re-center.

A universal chuck has jaws North, South, East and West.



"Don't monkey with a lathe dog while it is running."

To loosen a screw you unwind it.

When using a drill in the lathe, the drill is screwed into the tailstock.

To remove the drill, turn the spindle around until eyes meet, then sock it out.

With the help of a forge you could get a piece of iron red hot and bend it nearly double.

A burr is a noise made by the machine.

You use a half center so that your job turns only half as fast.

The lead of a screw is the part that is not threaded.

When drilling a hole, if your drill does not follow the marked-off lines, turn the job over and drill from the opposite side.

A face plate should be hard against the spindle of the lathe so that it will not turn round with the job.

The lathe spindle is bored out to take care of the cuttings.

A caliper is an instrument having two arms; one is curved and other is on the next page.

One wartime emergency student, in applying for a job, said that he was well up in mathematics but he hadn't got as far as fractions!

TIPS for Top Shop Men

171 When you check on a mistake, check for causes, not for a goat. Use each mistake as an object lesson to remove causes.

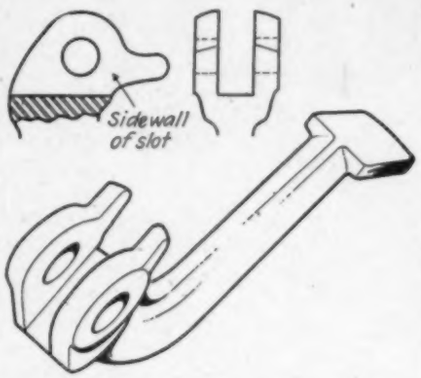
172 Be sure, when you pry into men's private lives, you're doing it for the good of the group, not to dig up personal dirt or to get something on somebody. What a man does outside working hours is none of your business unless it affects his work.

173 Don't wear your heart on your sleeve. If there's an easy way to get you "where you live," some joker will always take pleasure doing just that.

174 Formulas are useful tools, as helpful in engineering as gages are in shopwork—and just as likely to get out of kilter or to be inadequate for the job. Formulas can't replace the ability to think.

OUR SHOP...22 — *Heat-Treating Dept.*

What AC Learned in Broaching Two Parts



1.. In broaching the rocker-arm slot, the depth of cut is such that every inch of the tool must cut at capacity, thus requiring a nice balance between chip load per tooth and tool life

Details of Broach Sections for Slotting Rocker Arm — Method 1

BROACH SECTION	LENGTH	TOOTH SPACING	CHIP THICKNESS IN.	WIDTH OF TOOTH IN.	HOOK
Roughing Sections					
1	11.687	18 at 1/4"	0.0048	0.311	15°
			.0053(new)		
		20 at 5/16"	0.0045		
			0.0050(new)		
2	11.375	35 at 5/16"	0.0045	0.310	15°
3	11.593	25 at 3/8"	0.0045	0.309	15°
		11 at 3/8"	0.0035		
4	11.312	29 at 3/8"	0.0031	0.308	15°
5	11.312	29 at 3/8"	0.0031	0.307	15°
6	11.220	29 at 3/8"	0.0031	0.306	15°
Finishing Section	5 5/8	14 at 3/8"	0.008" on bottom 0.001 in. max to 0.00025 min.	0.312-0.317	15° 20°(new)

Note: Entries listed as "new" refer to the tools developed for Method 2, not further changes in prospect

BY RUPERT LE GRAND
ASSOCIATE EDITOR

TOOL DEVELOPMENT is as necessary for broaching as for other processes, in order to assure satisfactory quality, production and tool life. And this is true despite considerable experience possessed by process engineers and broach designers. Two parts manufactured by AC Spark Plug Division, General Motors Corporation, provide case examples of such broach development programs.

The first example is that of slotting a drop-forged rocker arm, Fig. 1. The slot, 0.317 in. wide by approximately 3/4 in. deep, must have a smooth, flat bottom located with respect to a certain part axis, the corners of the slot must be sharp and the side walls must be parallel. But in cross-section, it is evident that the volume of metal removed increases with the depth of cut. Besides, the flash trim line is not consistent; it may vary from 0.008 to 0.020 in. above the body of the piece.

Method 1—The broaching process consisted of removing metal in two stages: (1) to rough-cut a slot with stepped tapered walls, and then (2) to clean up the bottom and cut the side walls square. These two steps are accomplished with a broach 73 in. long instead of the desired 90 in. The tool consisted of six roughing sections followed by one finishing section. Design details are tabulated, and the pertinent features are shown in Fig. 2. The bumper tooth coped successfully with variations in the height of the flash trim line.

Analysis of the roughing sections disclosed that they cut a stepped slot 0.312 in. wide at the top and 0.306 in. wide at the bottom. These broach sections were made up with various numbers of teeth, as tabulated, and with the chip load distributed according to an analysis of metal removal at various depths. Note that the chip thickness varied from 0.0053 to 0.0031 in.

To remove the balance of the material from the slot, the finishing section was made with combination end and side cutting teeth. To finish the sides of the slot, the side cutting teeth originally had a uniform rise of 0.002 in. for the first six spaces, after which the rise was decreased to 0.001 in. per tooth and finally 0.0005 in. The end cutting sections of the teeth had a uniform rise of 0.0008 in.

The tools were difficult to grind, and grinding was done every 10,000 pcs. regardless of condition, to avoid broken teeth, loading, flaking back of the cutting edge and excessive removal of broach material.

From experience with the operation, and further tool development, it was possible to devise a generating method that boosted output per grind to 20,000 pcs., although some breakage of the bumper tooth section still occurs from excessive tooth loading.

Method 2—With proper clearance on the roughing sections, it was believed that the slot could be generated 0.317 in. wide. The teeth of the roughing sections, Fig. 2, are ground on the face, losing width because of the 3/4° clearance required. At first the original finishing section was retained, but later it was superseded with a revised design. Fig. 2. The rise remains at 0.0008 in. per tooth but the cutting angle has been changed from 15° to 20°. Thus, the roughing sections cut a rectangular slot and the last section finishes the bottom and side walls. However, it is believed that the possibility of breakage of roughing section No. 1 will be decreased by reducing the chip load per tooth and making compensating increases throughout the balance of the roughing sections. Such adjustments in tool design are common when the product must be produced at the rate of 7000 pcs. per day and tool breakage may occur because variations in stock throw excessive loads on the broach.

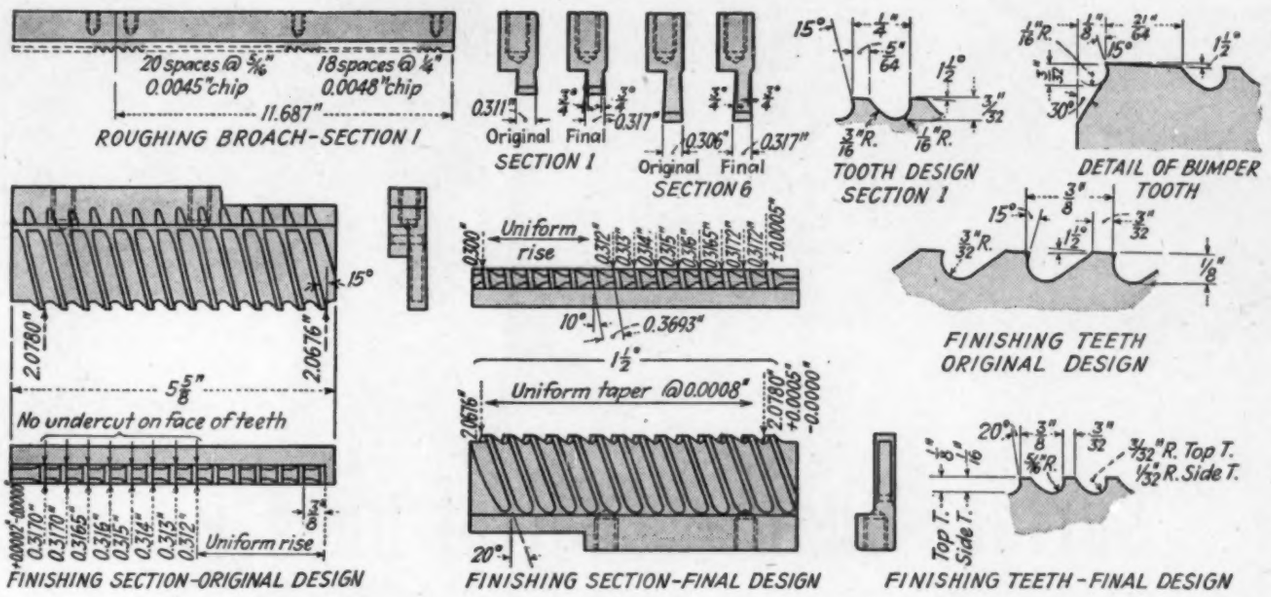
Pull-rod Broaching

When the pull rod was changed from an SAE 1117 screw-machine part to a SAE 1016 basic wire-header part (*AM*, p. 86, Jan. 30, 1947), the problem of broaching the tang was

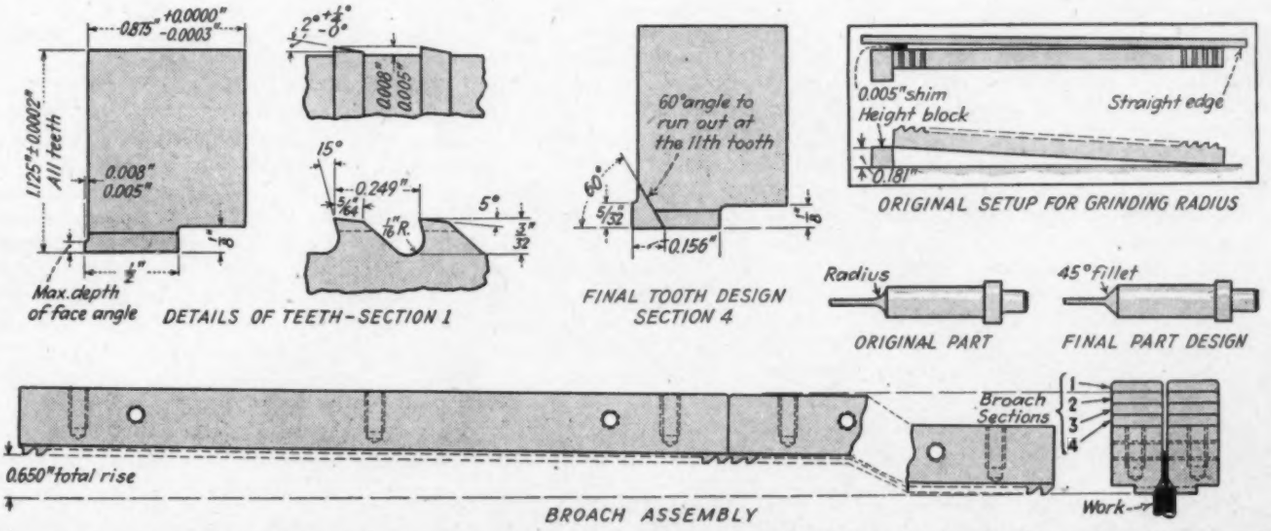
made more difficult. At this point, the design, Fig. 3, called for a 0.156-in. radius joining the body and the tang.

Straddle broaches are used to produce the tang. They consist of 8 sections, four per side, the total length being 48 in., and the total rise 0.650 in. To rough out the stock, the first three pairs of broach sections have cross-sections as shown in Fig. 3. But to finish the radius, the No. 4 broach sections were ground with a 0.156 in. radius on the corner, starting at the end and running back to nothing at approximately 9 in. from the end. The grinding of this radius presented a problem until the setup shown in Fig. 3 was devised. This consisted of putting the broach on a magnetic chuck, shimming it 0.005 in. at the back end with respect to a straightedge and raising the same end with a 0.181 in. height block. Then by feeding a 0.156-in. radius wheel down about 0.156 in. the radius was ground until it ran out at the fourth to seventh tooth, leaving the first few teeth in this section with a sharp corner.

To simplify the broaching problem still further, the part was redesigned so that a 45° taper, instead of a radius, joins the body and tang. Now a simple angle of 0.156 in. x 60° that runs out at the tenth or twelfth tooth is used. Broach life per grind has also been improved to 100,000 pcs. by increasing the clearance angle on the top of the tooth from 2° to 5° and the clearance angle on the side of the tooth from ½° to 2°. The sides of the broach are also relieved 0.008 in. below the bottom of the 15° face angle to prevent the radius in the bottom of the tooth from cutting with a negative rake angle and causing tooth loading. These improvements have made possible runs of 150,000 pcs. on occasion, but runs are now limited to 100,000 pcs., per grind to avoid possible damage and to minimize the amount of material removed per grind.



2.. As seen in end views of the roughing sections, the principal change was to generate the slot 0.317 in. wide. This simplified the grinding problem, raised the number of pieces per grind



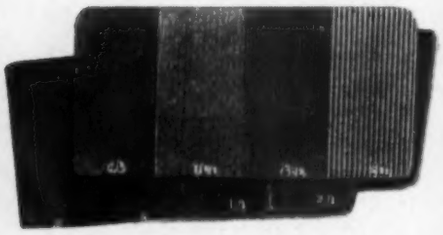
3.. An 8-section straddle broach, four sections per side, cuts the tang on the pull rod. When the last section was ground with a radius tapering back to nothing, "line" cutting was secured by contact of points on successive teeth. Although this was a novel solution of the radius-broaching problem, tool life was increased by changing the product design

Machinist checks part against roughness standards prepared by N-H Gage Company, North Hollywood, Calif.

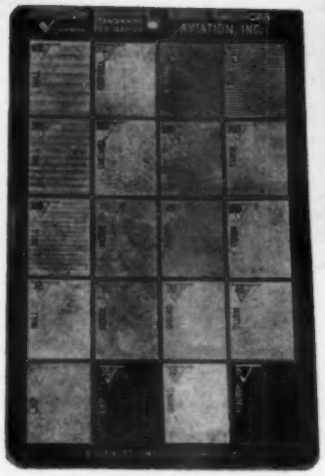
ROUGHNESS STANDARDS

Machined surfaces are distinguishable by process, and replicas are made to various microinch readings. Visual and fingernail comparison with the work establishes if latter is within maximum allowable surface roughness

Machinists and inspectors have long used standard roughness specimens produced by the General Electric Co., Schenectady



Above—Pocket-size comparators are made by U. S. Rubber Co., Detroit



Left—Roughness standards issued by Surface Checking Gage Co., Hollywood

Surface-Quality Control Does Pay

BY JAMES A. BROADSTON,
CHIEF ENGINEER, SURFACE CHECKING GAGE COMPANY

INDUSTRIAL USE of surface-quality control lags because many practical men do not realize that methods for measurement of surface roughness are no longer laboratory curiosities. Reasons for this situation are: (1) most articles on the subject have been written by technicians who did not answer the question, "Will it pay?"; and (2) shop personnel have often lacked the experience to use existing methods to full advantage.

There is much evidence that control of surface quality will pay. Said R.E.W. Harrison: "Surface-quality control is even more important than rust prevention, inasmuch as improper control of quality wears out more machinery than any other single factor." The fact that the modern automobile engine will run 100,000 miles is traceable to the fact that better finishes under proper control are applied to all wearing or loaded surfaces.

But the value of surface-quality control is not restricted to mass-production items like automobiles. It can take its place on other production lines and in the small shop. Think of the waste that can be avoided by applying fine finishes only to surfaces that need them, and by extending control to rougher surfaces. For example, consider a simple assembly like the piston and rod for an hydraulic strut.

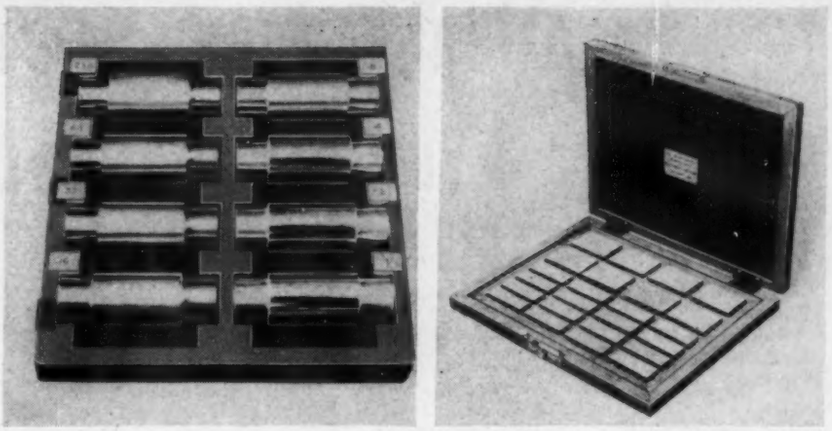
Without instructions to the contrary, the old-time machinist would be likely to finish the piston and rod all over. First, he would take pride in the appearance of the job; and second, he would not consider a rough surface or a chatter mark acceptable shop practice. Actually, the rod should be smooth to avoid wear on the packing gland; the piston need not be as smooth, and the faces of the piston can be left with a surface obtained by high-speed machining. Only the designer has at his fingertips the considerations that call for a specific surface quality on each part and the surfaces thereof. So it is his responsibility to designate on the drawing the required surface quality on each surface. This can be done with roughness numbers, which indicate the maximum allowable average surface roughness in microinches, as indicated either by instrument or by fingernail comparison with standard roughness blocks having known roughness values. (Ed. Note: see the Reference Book Sheet in this number, entitled

"Surface Roughness, Waviness and Lay.").

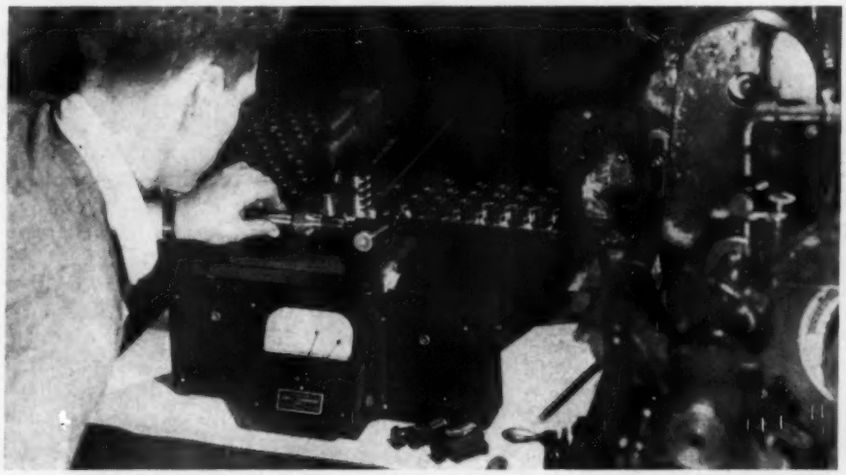
If shops generally will adopt a system of this kind, they will save much misapplication of effort, many hours of argument by engineering, production and inspection, and disagreements with suppliers and customers. But they need to overlook the arguments among technicians over the failures of instrumentation. No one yet has found an instrument that will do the whole job, which is understandable when one realizes the number of surfaces. Fortunately, the eye distinguishes between finishes produced by milling, turning, shaping, lapping, honing and grinding. By making samples of surfaces that have given satisfactory performance, all further production can be kept under control by use of direct instrument comparison. This is particularly true of fine finishes.

For the rougher finishes also needing shop control, manufacturers have found that the problem is solved by distribution of sets of standard surface-finish samples. Average machine finishes can be checked by such means in many shops for an expenditure of less than $100. Replica standards also cost little, and by fingernail comparison the engineer, machinist, inspector and assembler can tell if parts produced by a specific method are satisfactory in respect to surface roughness.

Measurements of surface roughness are given in terms of microinches. It is doubtful that the microinch RMS. designation (root mean square deviation from the mean) is really any better than the arithmetical average of peak to valley, or depth, of scratch. In fact, there is a tendency to forget the RMS. complication until a suitable index of performance has been evolved from tests on representative surfaces whose roughnesses are adequately known. The difference between the two units of roughness measurement is less than acceptable tolerances and within the accuracy range of existing instrumentation. Obviously, there are many practical difficulties to overcome before there can be any generally accepted standards for performance of different reasonable results can be obtained machine finishes. However, since with existing means for checking roughness of machined finishes, it is practical now to take three steps: (1) adopt a suitable system of drawing notation, (2) obtain instrumentation suitable to the checking problems involved and (3) train personnel in their use.

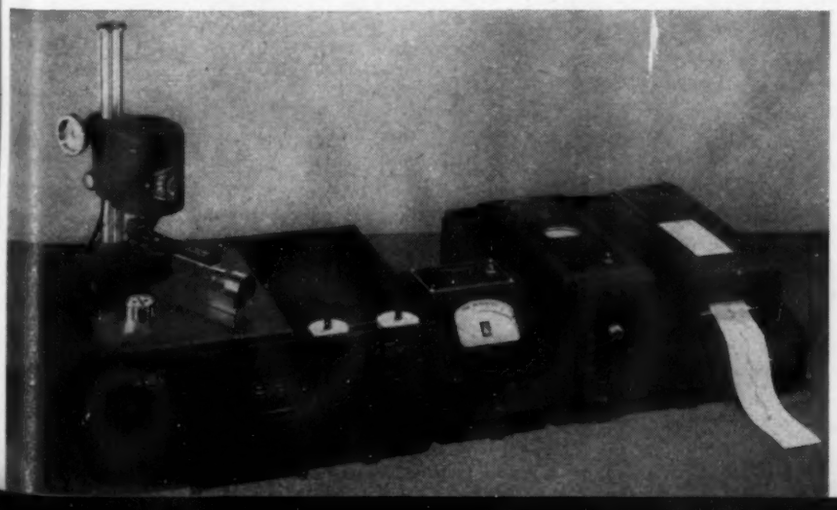


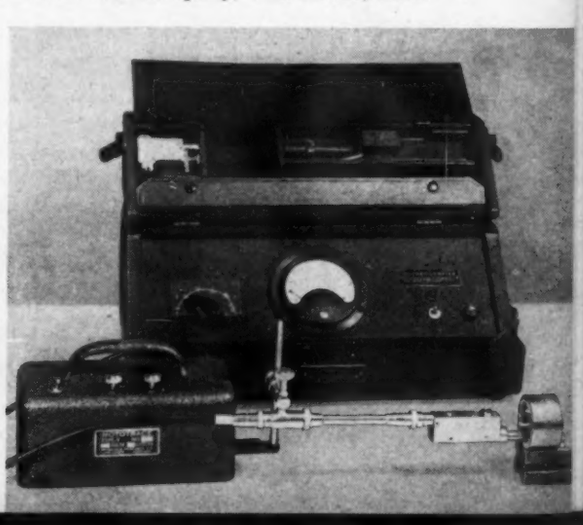
Finish samples are also used for fingernail and visual comparison. Left—Grinding samples made by Norton Company, Worcester, Mass. Right—Machined-finish samples (stainless steel) produced by University Machine Company, Cambridge, Mass.



In an optical surface finish comparator made by the Comptor Company, Waltham, Mass., a meter reading serves as the index of surface roughness, especially of fine finishes

Tracer-point analyzers reputedly work well on finer finishes. **Left—Surface analyzer made by Brush Development Company, Cleveland. Right—The Profilometer designed by the Physicists Research Company, Ann Arbor, Mich.**





Practical Grievance Procedure Avoids Real Trouble

BY O. C. COOL

PRESIDENT, THE LABOR RELATIONS INSTITUTE

MANAGEMENT, in failing to take a clinical attitude towards grievances, has overlooked the safest and surest method to avoid strikes and assure maximum productivity.

Grievances are symptoms, not ills. As long as grievances appear in normal volume, management has a basis for believing that the grievance machinery is working smoothly and that workers are reacting in a sane and reasonable way toward their real and imagined wrongs. But more important, grievances point to areas of worker dissatisfaction and give management the opportunity to apply suitable remedies. It is the neglected grievance that spells danger.

Many industrial companies have a blind spot on grievances. To paraphrase an old advertising slogan, such companies should see a good labor-relations consultant twice a year—and get a good industrial-relations manager.

Recognizing that grievances are frequently unavoidable, some managements are beginning to take a leaf from the unions' book. A handful of companies are pioneering in publicizing grievances to their employees. The Goodyear Tire & Rubber Company presents a brief "Weekly Review of Labor Relations," including grievances and their disposition, in its plant publication.

In former years, most managements would have shuddered at the mere inference that a grievance existed in their plants. Yet unions were, and still are, presenting lurid stories of grievances to workers—stories so far out of tune with the facts that a simple, straightforward statement of the truth by management cannot help but end baseless rumors and improve morale.

Failure of management to take cognizance of what most workers hear, through rumors or union publications, or know about through their own personal experience, exaggerates the importance of many petty grievances.

Today, some managements can afford to look a grievance in the face without growing pale and shouting, "It's a lie!" While making every effort to stamp out causes of discontent, these companies have established a step-by-step procedure for bringing grievances into the open, where they can be dealt with by clinical measures.

Much remains, however, to be accomplished in this direction. Headlines show that strikes reached an all-time high in this country during the last year. Worker morale and productivity are distressingly

Planned grievance procedure to find, handle and settle real or imagined complaints can help boost morale, head off strikes

low. Turnover and absenteeism are exceptionally high. All these factors are adding needlessly to current inflated production costs. Even the quality of work leaves much to be desired.

True, the direct cause of most strikes is the demand for higher wages. But, at such a time, there is still a need for effective machinery to deal with the many grievances that lie outside the wage question. Little "gripes" and grievances, if neglected, can grow into angry disputes. They cause countless strikes, or undermine morale and so reduce productivity.

Investigations show that in a surprisingly large proportion of industrial companies, the grievance machinery is either archaic or rusty. Often such neglect is the basic cause of unauthorized work stoppages.

Our studies show that wage issues have accounted directly for only a little more than half of the work stoppages this year. In 40% of the strikes, the dominant cause was not wages, but miscellaneous differences, many of which were not properly processed or even brought to light by the grievance machinery.

The term grievance *machinery* is used advisedly. Gripes and beefs do not float automatically from the aggrieved worker to his foreman, plant superintendent or personnel director. A mechanism must be established for "greeting the grievance" and carrying it swiftly to management. Such a mechanism should be no less real than the cranes, industrial trucks and conveyors that keep materials flowing to the processing equipment.

Many companies have long deluded themselves concerning grievance machinery. As a result, they are continuing to sustain punishing losses because of their failure to understand and take action on the causes of worker discontent. Two fallacies stand out with regard to the handling of grievances:

1. *The "Open-Door" Fallacy:* The erroneous belief that if management observes the "open-door" policy, workers will be stimulated to discuss their grievances with management. Actually, careful study shows that workers, when left to themselves, prefer to let real or imagined wrongs grow in importance, rather than take them to foremen or other representatives of management.

2. *The "No-Grievance" Fallacy:* The mistaken belief that if no grievances, or only a few, make their appearance, workers are satisfied with conditions.

The latter is one of the most naive and dangerous errors. When grievances are not showing up in the grievance machinery, management

may be sitting on a powder keg of inarticulate worker wrath. Every plant has grievances, and the failure of workers to make them known may mean that they are being stored and cherished in the workers' bosom for a large and costly explosion. A sharp decline in the number of complaints may be as accurate a barometer of impending trouble as an equally sharp rise in the number of grievances.

Clues to Discontent

Fortunately, management has other means of detecting the development of impending trouble:

1. Rapid rise in employee requests for transfers from one department to another within the organization.
2. Rapid increase in labor turnover.
3. Soaring rate of tardiness or turnover.
4. Declining rate of production, for no known reason.
5. Higher rate of rejections and reduced quality.
6. Spoilage of materials and damage to machinery.

Actually, a step-by-step procedure is needed to cope with the underlying causes of poor morale, when the latter is manifested by any one of the factors cited above. Each worker's grievance must be found, handled and settled, not with sweet promises, but with constructive policies that show management is responsive and eager to meet its workers more than half way.

Analysis of the types of grievances that workers are most likely to contract shows that failure to observe seniority standards is the most important cause of grievances. Workers value seniority, even above wage increases, and where layoffs and promotions ignore length of service, morale is sure to decline. On the basis of that knowledge, the employer who has never installed a seniority system would be well advised to set one up at the earliest possible moment.

But grievances that are the sore spots in any individual shop can not be determined quickly. Shops vary in respect to the intensity with which certain grievances are held, as well as with regard to the nature of the grievances. In a shop where the grievance procedure has become unreliable, particular grievances can be determined by exit interviews, employee - attitude surveys, gripe forms, suggestion boxes and from medical personnel.

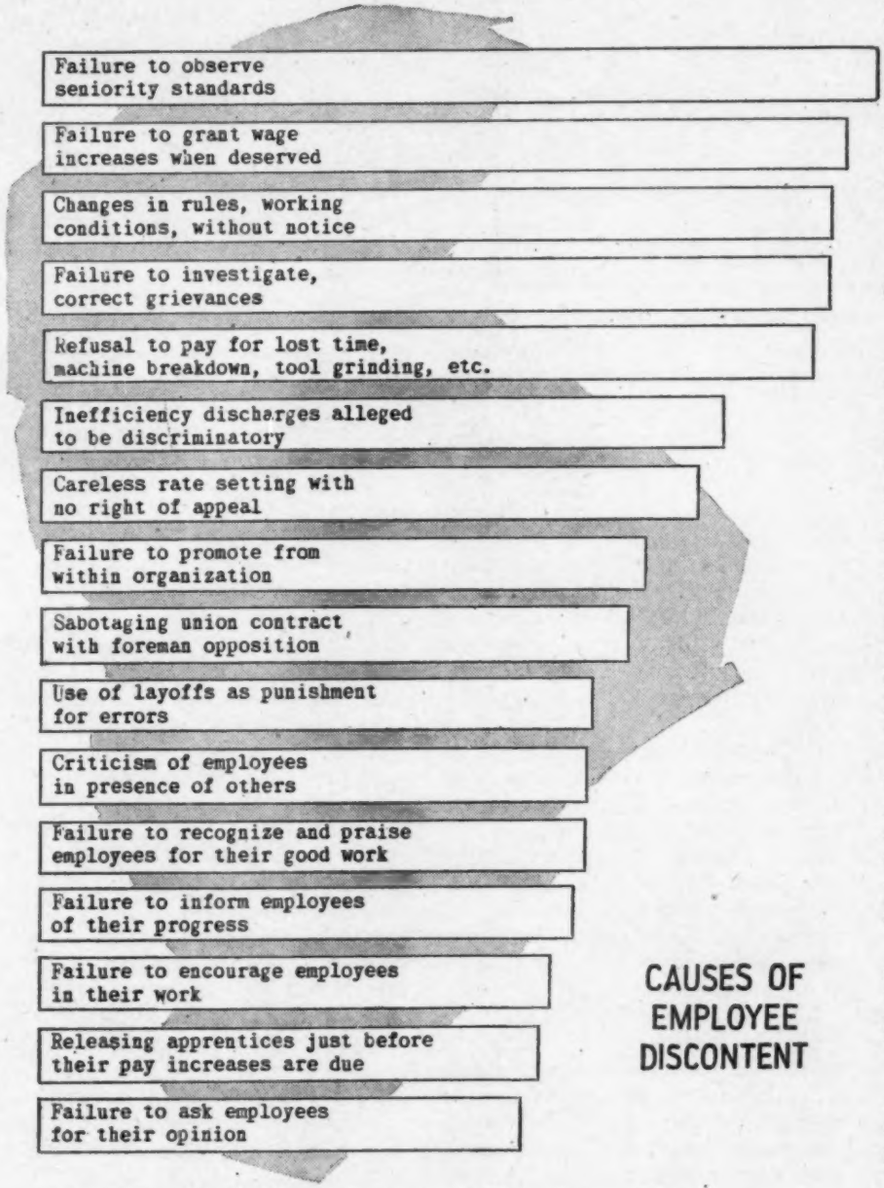
Exit Interviews Revealing

Exit interviews, if conducted properly, will reveal many causes of discontent. Employee-attitude surveys can do the same thing, but in time so unsettled grievances will not cause employees to quit. So-called gripe forms, usually not signed, also will indicate many secret grievances. Complaints are often received through the suggestion system. Management should not discourage this use of suggestion boxes, but should investigate each complaint thoroughly. Naturally, suggestion-plan prizes should not be awarded for such information.

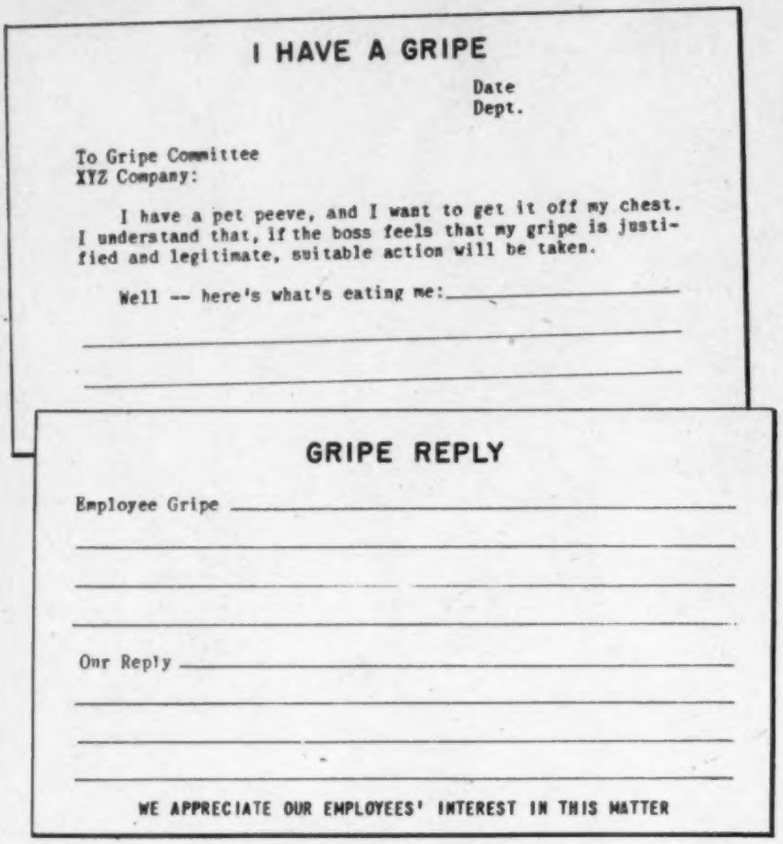
But valuable as the above opinion-testers are, the core of good labor relations is the grievance machinery. At no time is it good policy to use the exit interview, the attitude inventory or the gripe sheet as a substitute for a formal complaint.

Every plant needs a formal grievance setup, but none needs it more than the non-organized plant. A practical procedure for the employer in a non-union plant is to:

1. *Formulate your policy.* Set up a three-stage plan, providing for submission of the grievance to the foreman, a grievance report by the latter to top management outlining his decision and an opportunity for the worker to appeal, through a special appeal form, from the fore-


Failure to observe seniority standards
Failure to grant wage increases when deserved
Changes in rules, working conditions, without notice
Failure to investigate, correct grievances
Refusal to pay for lost time, machine breakdown, tool grinding, etc.
Inefficiency discharges alleged to be discriminatory
Careless rate setting with no right of appeal
Failure to promote from within organization
Sabotaging union contract with foreman opposition
Use of layoffs as punishment for errors
Criticism of employees in presence of others
Failure to recognize and praise employees for their good work
Failure to inform employees of their progress
Failure to encourage employees in their work
Releasing apprentices just before their pay increases are due
Failure to ask employees for their opinion
CAUSES OF EMPLOYEE DISCONTENT

A SURVEY *showed that of 16 principal causes of employee discontent, failure to observe seniority rules is most important, even more so than failure to give wage increases*



I HAVE A GRIPE

Date
Dept.

To Gripe Committee
XYZ Company:

I have a pet peeve, and I want to get it off my chest. I understand that, if the boss feels that my gripe is justified and legitimate, suitable action will be taken.

Well -- here's what's eating me:_____

GRIPE REPLY

Employee Gripe _____

Our Reply _____

WE APPRECIATE OUR EMPLOYEES' INTEREST IN THIS MATTER

SEMI-HUMOROUS "GRIPE" FORMS *urge workers to list their pet peeves and tell the boss "where to get off." Unsigned and deposited in gripe boxes, they reveal secret grievances*

PRACTICAL GRIEVANCE PROCEDURE AVOIDS TROUBLE—continued

man's decision, if he wishes to do so.

2. *Publicize your grievance machinery.* An occasional editorial or story in the house organ on a settled grievance will help keep the machinery well oiled. If an employee's handbook is issued, it should outline the grievance procedure. Gripe columns in the house organ may also be useful.

Grievances and Unions

In a unionized plant, the grievance situation is complicated by new personalities—the union shop steward, who is the key man for handling grievances, and the business agent, who is usually a full-time union official. It is particularly important that the foreman establish a good working arrangement with the shop steward. The foreman will be aided in attaining this objective if the labor contract contains sound rules on the number of stewards, the basis of choosing them and the procedure to be followed when the steward gets time off from the foreman to handle grievances.

A contract clause, for instance, that provides that stewards and committeemen shall be chosen from employees who have had at least one year's seniority with the company is generally helpful as older and more experienced workers know company policy better than newcomers.

Often it is wise to keep track of the time spent by stewards in handling grievances. If the union shares part or all of the cost of such activities, through a contract clause that states what portion of the steward's time off shall be paid by the company, it may mean that the steward will be more likely to stick to legitimate business.

Nothing is more important than a tightly knit grievance clause in the union contract. Such a clause must be broad enough to include all legitimate disputes. Yet it should also be so limited in scope as to prevent the grievance procedure from being made an entering wedge for costly encroachments on management's rights.

It is vital, in the grievance clause, to obtain a satisfactory definition of a grievance. A tight, all-purpose clause that keeps disputes within bounds and gives protection to the employer is:

> "A problem, dispute, complaint, or controversy between the company and the employees covered by this agreement on matters relating to (a) wages, hours of work or working conditions covered by this agreement and (b) the interpretation or violation of any provision of this agreement, shall only be deemed a grievance after the employee has failed to have such problem, dispute, complaint or controversy adjudicated to his satisfaction by the foreman."

Such a clause not only gives the foreman the proper management status he deserves, but assures the employee of his right to bring a complaint, individually if he so chooses, to the foreman without help of the union's shop steward.

Two Procedures

To keep the grievance procedure effective, it is advisable to adopt a three-stage procedure in a small company and a five-stage plan in a large one. The three-stage plan may be outlined as: (1) The employee, with or without the aid of the shop steward as he sees fit, takes his complaint to the foreman. A record is made of the grievance and of the settlement if made. (2) If the grievance is unsettled, it is put in writing in triplicate form. The union's business agent then takes the case directly to the head of the company. (3) If this fails, both parties take the dispute before an impartial chairman or arbitrator.

In the five-step plan for larger companies, the grievance is first taken to the supervisor and then by the business agent to the department supervisor. If no agreement is reached in three days, it is carried by the shop committee to top management. If no agreement is reached in three to five days, it is taken by the union regional director to the labor-management appeals committee, and in the fifth and final step, the latter committee submits the dispute to arbitration with an umpire.

Here are some points to observe in connection with arbitration, which is usually the last step in the grievance procedure:

> Arbitration is a judicial process, and the decision of the umpire or referee is legally binding. There-

fore, do not indiscriminately consign all differences to blanket arbitration.

The arbitration clause should be carefully drawn to limit the authority of the arbitrator. Insert a share-the-cost proviso in the arbitration clause. Unless this is done, the union may bring every grievance to the final stage, regardless of the cost to the company.

Insert a provision in the contract that all unsettled disputes must be brought to arbitration within 15 days after management and union have been unable to reach a satisfactory settlement.

The contract should contain a proviso barring any suspension of work until every means of settling the dispute through the grievance procedure, including arbitration, has been exhausted.

The Foreman is the Key

Unless the foreman is carefully indoctrinated, the most carefully planned grievance machinery will falter and bog down. The foreman is the key to sound handling of complaints. He is in a position to settle many minor complaints at the start, before they become heated and inflated by argument involving top union officials and management. Here is a list of do's and don'ts for the foreman to observe:

1. Listen carefully to the employee's story from start to finish without interrupting.
2. Put the worker completely at ease by taking him away from the eyes of his fellow workers and by adopting a friendly tone.
3. Be patient and don't rush the employee, even if you see that his grievance is an imaginary or poorly founded one.
4. Remember that the worker's emotions influence his perspective. Treat the complaint as though it is extremely important.
5. Don't let the discussion degenerate into an argument. If the worker is getting out of control, calm him down tactfully.
6. After you have heard the whole story, check it against the facts.
7. In questioning the worker, tone down his extreme statements to a more moderate position, by rephrasing his main points more in keeping with the facts, followed by the query, "Is that what you mean?"
8. In settling the case, avoid snap judgments. If you are not sure of all the facts, don't stick your neck out. Ask for more time to consider.
9. In giving your decision, supply the all-important reasons behind it.
10. Never pass the buck to someone higher up, unless the decision is one beyond your authority to make.
11. If the worker's grievance is legitimate, admit your mistake in supervising him. Act promptly to make the indicated adjustment.

GRIEVANCE APPEAL FORM
XYZ COMPANY

Name William A. Jones No. 1642-AC Time 3:50 p.m. Date June 2, 1946

Department Grinding Job Grinder Foreman Bill Smith

What is your complaint? I feel I should be counted in on the overtime for half the department under the Company's new work curtailment program. I think I am just as entitled to it as the workers who have been put on. It's my belief that the foreman has it in for me because I once asked for a transfer out of the dept.

What action did your foreman take? Foreman claims that I was left out due to my absenteeism record and high rate of rejects.

Signed William A. Jones

(Do not write below this line)

Date Received June 2 - Discussed with foreman and worker

Disposition made: Foreman Smith adjudged correct. Worker Jones has record of eight days absent in last three months. His rate of rejects is 6% higher than nearest worker in department. Recommend a personal letter be sent worker.

Signed J. B. Diamond
Vice-President

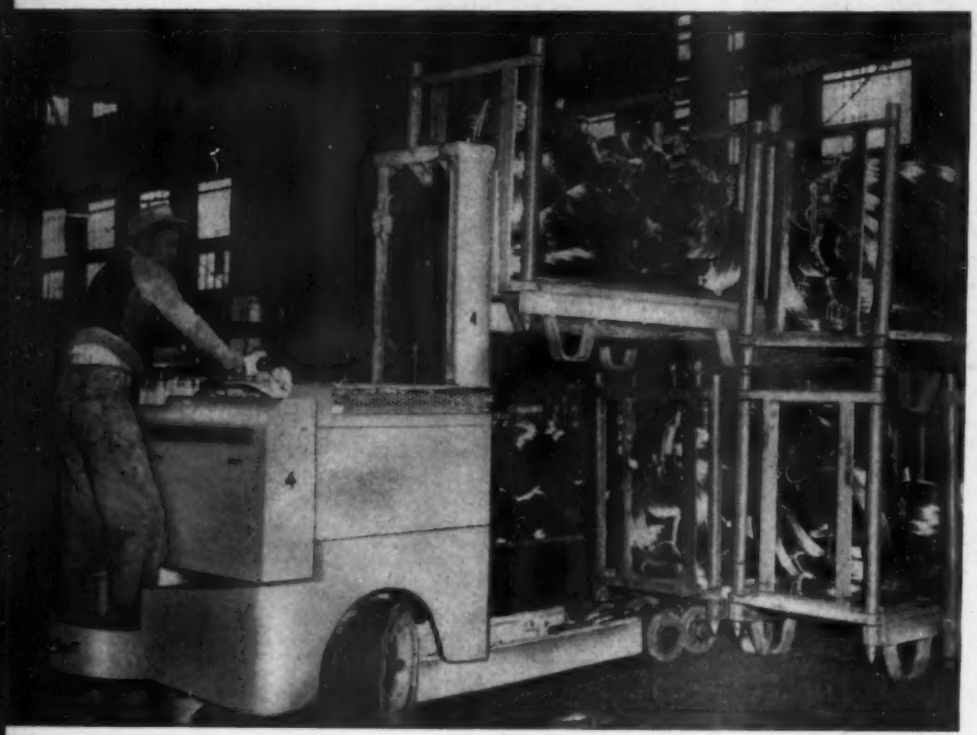
Comments: None

GRIEVANCE *machinery should permit the right to appeal a foreman's decision to top management. Appeal forms simplify procedure and get grievances and decisions on record*

A Final Point

A final point, overlooked by many managements, is that grievance machinery can be a two-way channeling device. It can carry management's grievances to the workers, if it is soundly constructed. Employer grievances that can be transmitted to the union through grievance machinery include: The shop steward is spending too much time handling trifling and unwarranted complaints; the union has suddenly departed from previous interpretations of the contract provisions; and union officials back down on stated intentions to take justified disciplinary action against members.

From the first to the last stage of the grievance machinery, management must make sure that every individual involved in making the machinery work smoothly is doing his part. Once established, the grievance mechanism is not self-oiling. A check-up at regular intervals will make sure that new factors or new team members have not gradually worn out some "grievance gears."



Wire coils can be handily stored on tiering skids that have piping uprights at each corner. The bottom of each upright has a nesting plug that locates in the open end of the lower skid upright, holding tiered skids steady

AIR RIGHTS GIVE FLOOR RIGHTS

When plant expansion seems a must, when stored goods clog your production paths, storage "air rights" may be your answer

No. 1 HEADACHE for many metalworking plants is the storage problem. Lack of balance between current production and existing facilities, shortage of freight cars, over-abundance of some materials and shortages of others—all combine to aggravate storage difficulties.

Incoming materials pile up outside the door, outgoing products pile up inside the door and the warehouse supervisor and production manager quietly go "nuts"—instead of "up."

Most plants have realized the advantages of expanding upward—of tiering to save floor space and money, to reduce plant congestion, to lend flexibility to layout, to bring stored goods closer to production machinery and shipping departments. Their executives have become air-minded, but all too many plants have not yet begun to use this valuable, long-neglected storage space.

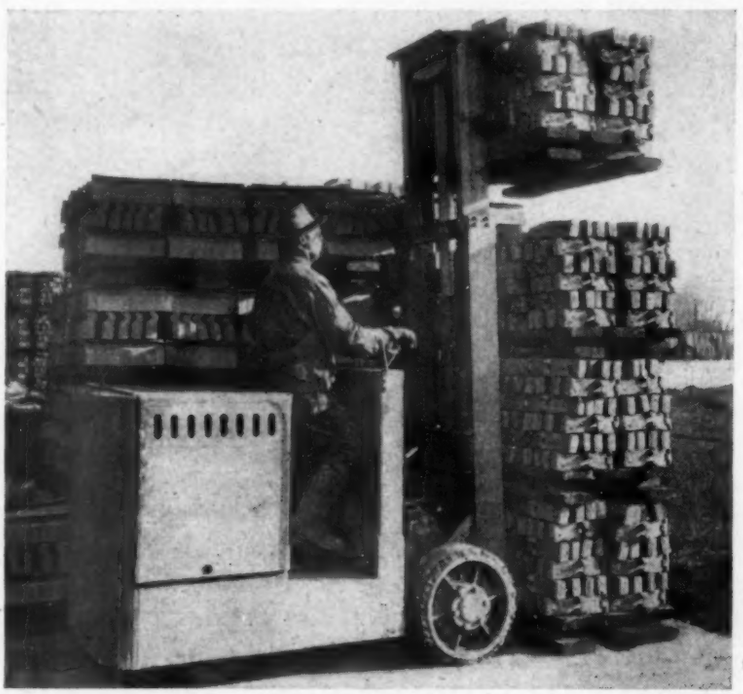
The money-savings advantages offered by vertical storage are well illustrated by a comparative cost study supplied us by the Electric Industrial Truck Association. Tiering of goods only 6 ft. high, over a floor area of 100,000 sq. ft., would represent use of $500,000 worth of space at a storage construction rate of $5 per sq. ft.

By tiering 12 ft. high, the same quantity of raw materials or products would occupy only 60,000 sq. ft. at $300,000. Going up to 18 ft. reduces floor area to 46,666 sq. ft., representing only $233,333.

A survey of several progressive metalworking plants indicated an awareness of the increasing importance of maximum plant utilization. The Copperweld Steel Co., for example, by use of special tiering skids and high-lift platform trucks, doubled its effective storage space in the shipping department. The 5,000-lb. loads of copper-covered steel wire, awaiting outbound shipment, are tiered two-high by bottom plugs in skid uprights nesting in the open-end uprights of lower skids.

Tiering is not only adapted to inside storage. The American Brake Shoe Co. stores brakeshoe castings outdoors on heavy, double-faced wood pallets. Castings are stacked six-high with four stacks to each pallet, and pallet loads are tiered four-high.

Palletizing these castings, small but often difficult to store and handle because of their odd shape, meant less manual work and more effective handling and storage.



Brakeshoes, not easily handled manually, can be palletized in 3,800-lb. loads for outdoor storage. With 96 castings per pallet, loads are tiered four-high to save storage-yard space

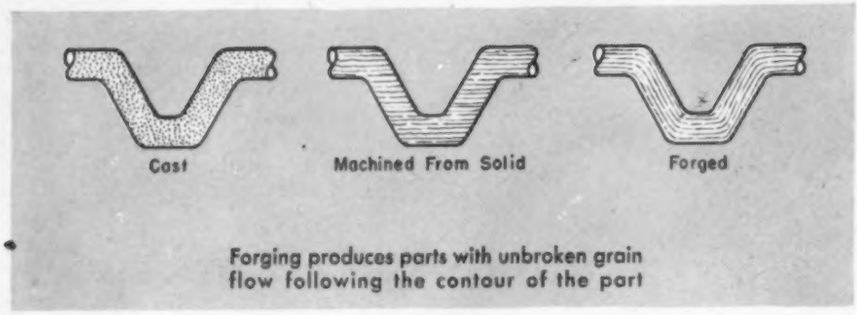
FUNDAMENTALS OF Forging

BY ANDERSON ASHBURN
ASSOCIATE EDITOR

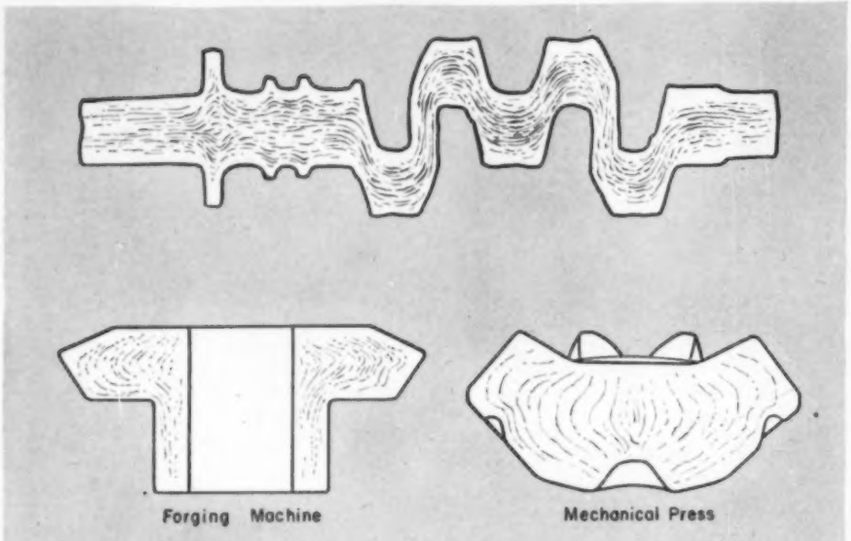
NO METHOD of metalworking is older or more spectacular than forging. And none has been more neglected by industry in general. Forging has long been noisy, dirty and unpleasant, which may explain why so little is known about it outside the forge shops. But no other form of metalworking can compare with forging in the strength of the part produced, and methods are improving, applications are increasing. As speeds of travel and of machinery increase, forgings become more necessary. As light weight becomes more desirable, the ability of forgings to provide strength with minimum weight becomes more attractive. As more use is made of hard, heat-resistant alloys on which machining is difficult, the ability to forge to close tolerances becomes more essential.

To provide a comprehensive study of the subject, American Machinist presents two special reports which cover the entire field of forging. This first report presents the basic data necessary to understand the subject. It discusses the methods of forging, the equipment and dies that are used. The second report will cover the forgeable materials, from brass to high-temperature alloy steels, and discuss the latest techniques for forging each of them by various methods.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRY



Forging produces parts with unbroken grain flow following the contour of the part



Forgings produced in hammers, forging machines and presses each show the characteristic grain flow

TYPES OF FORGING

FORGING was once defined as the process of shaping metal by heating and hammering. Today metal is not always heated for forging and much of the work is done in various forms of presses.

Working a metal to a desired shape by forging produces the best combination of physical characteristics for parts which will be highly stressed. Starting with the rolling of the ingot, the steps involved in producing a forging combine to produce a refined grain with a fiber-like structure. This introduces flow lines and directional properties. In most cases the design and processing can be arranged to take advantage of these directional properties.

Basically, metal can be forged by impact or pressure. When forged by impact in hammers the part can be formed by dies which are flat or slightly shaped (smith forging) or in closed impression dies (drop forging). Presses can also be used for flat-die forging, and the largest work is invariably done in hydraulic presses.

Forgings formed by pressure may be made in forging machines or in mechanical or hydraulic presses. Forging rolls are used for specialized work. Sometimes equipment not designed for forging, such as the bulldozer, is adapted to the production of forgings.

Smith forgings (sometimes known as hand, hammered, flat die, or blacksmith forgings) are commonly produced on steam hammers. Small forgings may be made with motor-driven pneumatic hammers or helve hammers.

With stock tools a skilled operator can produce forgings of surprising accuracy. The rate of production is relatively low in most cases and smith forging is principally used where the quantity is too low to justify dies or the work is needed too quickly to permit die sinking. An exception is certain special pieces such as weldless steel rings which are regularly produced by this method.

Drop forgings (also known as impact die forgings) account for most of the tonnage produced commercially. They are formed by impact pressure on board drop, steam drop or gravity drop hammers. The hammers are built to maintain alignment between top and bottom dies. The part is processed through a series of die impressions, generally combined in a single set of dies but sometimes requiring two or more sets. In the latter case it is often possible to have hammers arranged to complete the forging with only one heating.

Machine forgings (also known as upset forgings) are produced on horizontal, double-acting presses known as forging machines or upsetters. Operations such as bolts, capscrews and rivets are made in cold headers, but most work is done hot. The heated bar stock is placed between a pair of gripper dies which close on the work before the header slide pushes a punch against the plastic metal to force it into the die impression. Simple parts can be produced in one pass. Several passes can be incorporated in one set of dies and punches when required.

Press forgings are formed in mechanical or hydraulic presses. The action is similar to that of the forging machine except that ram movement is vertical. Split lower dies as in the forging machine are possible, but are rarely employed. In some respects the dies are similar to those used for drop forging but there are variations in design and, in general, the construction is more flexible. Individual die sections can be mounted on a bolster plate and die inserts can be used. Normally one stroke of the press is used in each impression. Knockout pins eject the work from the dies.

Initially press forging was used for parts of fairly symmetrical shape, but more recently it has been used for irregular work with preliminary operations for blocking and bending before final forging.

Each method of forging can be used independently or in combination with other methods. Smith or roll forging, for example, is frequently a preliminary to drop or press forging. Sometimes work is blocked in a hammer, finished in a press; sometimes the reverse is true.

HAMMERS

FOR preliminary forging operations and for small-quantity production the steam forging hammer is employed. The hammers are made in single- and double-frame styles and, though called steam hammers, can operate on either steam or compressed air.

Single-frame hammers are made either with the anvil integral with the frame (self-contained) or separate. Dies are set at an angle of about 35° from the center line of the frame so long bars can be worked through the dies in either direction without interference.

Steam hammers receive a rating based on the weight of the reciprocating parts. These include the top die, ram, piston rod and piston. The actual weight of these parts may be somewhat higher than they are rated. Single-frame hammers range from 50 to 5,000 lb., but the self-contained hammers are limited to sizes of 300 lb. or less.

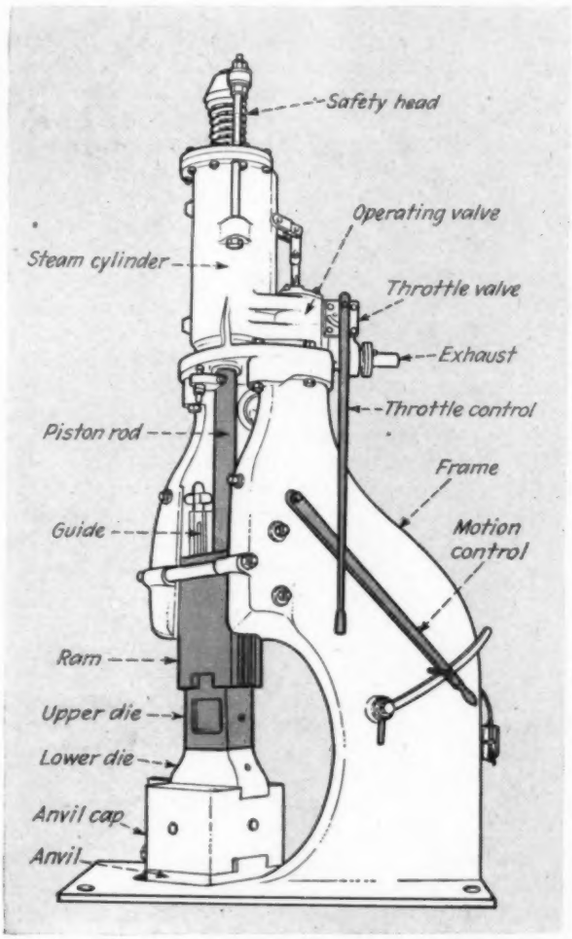
Double-frame hammers are generally made in larger sizes and are suited to heavier work. The dies are not as accessible as they are in the single-frame hammer. Sizes of double-frame hammers range from about 1,000 to 25,000 lb.

The ram, direct-connected to a piston, is raised and lowered by pressure of steam or air in the cylinder above it. The piston is double-acting so steam can be used to raise the ram and also to augment or retard the force of gravity in lowering the ram. The force of blow can be controlled from a light tap to the maximum possible.

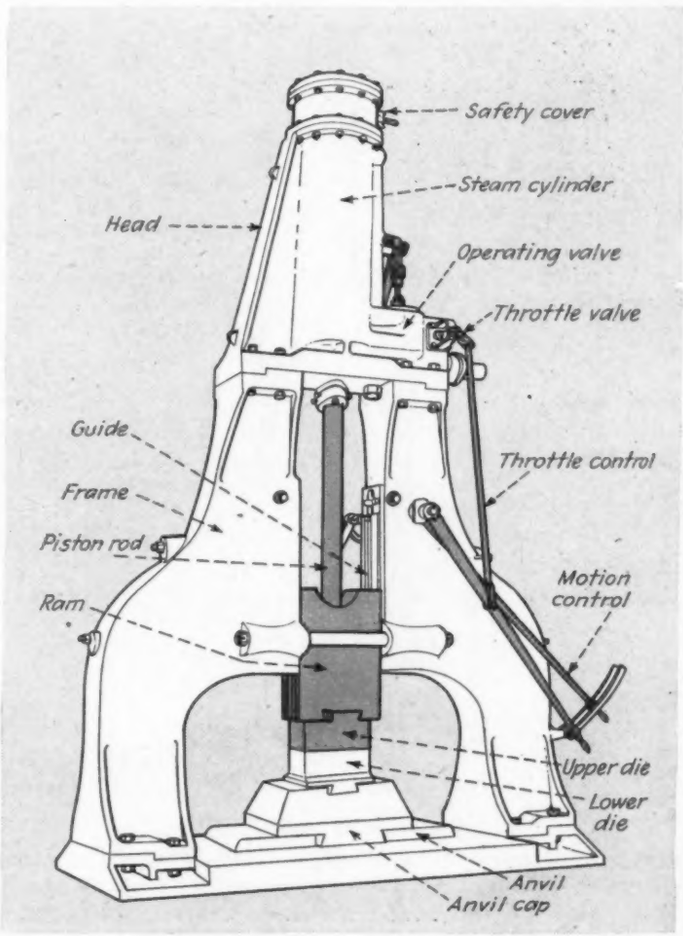
Choice of hammer size was formerly often determined by a rule of thumb that there should be 100 lb. of rated size for each 2 sq. in. of cross-sectional area. On modern hammers it is often possible to obtain effective results with a smaller hammer than this. One maker, for example, suggests up to 4 or 5 sq. in. for each 100 lb. of rated size.

A hammer is not damaged by work that is too large, but a small hammer will require more blows and may involve several reheatings, making a hammer that is too small less efficient.

The ratio of anvil weight to falling weight (anvil ratio) is important. On any hammer operation some of the energy will be lost in movement of the anvil. The harder the metal being forged is, or the less it is penetrated when a blow of maximum force is struck, the more effect this anvil ratio will have. The larger the anvil, the more the hammer will cost but the more effective each blow will be. Selection of the anvil ratio for a particular hammer will depend largely on the material to be forged. One theoretical computation of the loss through anvil movement (assuming an anvil sus-



Single-frame steam forging hammer with separate anvil. The portion of the anvil which extends below the floor line and the foundation do not show



An 8,000-lb. double-frame steam forging hammer. Design and method of operation are similar to the single-frame hammer. Drawings show typical features and not specific models

pended in air thus resisting the blow only with its own inertia) is 11% with an 8 to 1 ratio, 7½% with a 12 to 1 ratio, and 6% with a 15 to 1 ratio. Actual loss is less than this because the timber cushion and concrete foundation provide resistance.

Steam hammers for forging alloy steel commonly have a 15 to 1 ratio. Some hammers are made with a lower anvil ratio for lighter work. If the hammer is to be used steadily, the higher cost of the heavier anvil is generally justified, so the trend is to heavier anvils.

One maker reports steam supplied to the hammer may be as low as 60 psi., but for effective operation is generally 80 to 100 psi. on single-frame and 100 to 120 psi. on double-frame hammers. Compressed air can be used at somewhat lower pressure because there is no condensation loss. Typical pressures are 80 psi. for single-frame and 90 psi. for double-frame hammers.

The choice between the two methods will depend on the particular plant. The hammer can be started more quickly and operates at a lower temperature on compressed air, but if the plant has an efficient steam-generating installation, steam is cheaper. If steam is used, the exhaust steam can be employed at 5 psi. for heating or other purposes.

Pneumatic Hammers

Pneumatic hammers are a distinctive type of hammer unlike the steam forging hammer driven by compressed air. In the pneumatic hammer the power is supplied by an electric motor mounted at the rear which drives a double-acting compressor cylinder interconnected with a double-acting power cylinder. They are made with moving weights of 200 to 5,000 lb. and are generally used where isolated hammers are required. One maker equips a pneumatic hammer with extra guides so it may be used for small drop forgings, but such hammers are generally confined to flat-die work.

In the pneumatic hammer, a uniform number of blows per minute is struck, and this rate is not affected by varying the force of the blow.

Basically, the principle is one of operating the compressor piston at a uniform speed. When it moves up, the air is exhausted below the ram piston and at the same time is compressed above the ram piston, driving the ram down. When the compressor piston descends, the ram piston is raised. The valves between the top sections and bottom sections of the cylinders are opened by a control lever or treadle, with the extent of opening controlling the force of the blows.

Drop Hammers

Impact die forgings, or drop forgings, are produced in closed impression dies in drop hammers. Drop hammers have the guides and other parts designed to maintain alignment between the dies. The principal types are the board drop hammer and the steam drop hammer.

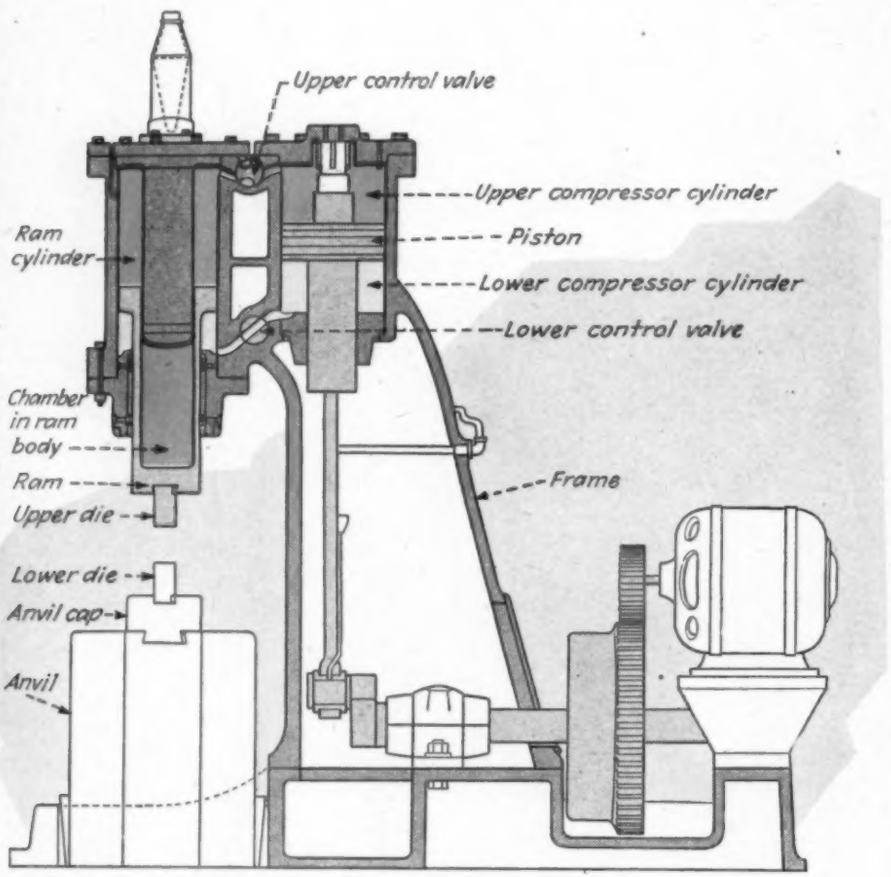
Board Drop Hammers

Gravity is the force employed in the board drop hammer. The ram is raised to striking position by means of boards, the lower ends of which are wedged into the ram. The upper ends of the boards pass between one or two pairs of rolls. With the two rolls in a pair rotating in opposite directions, the boards and ram are raised when the rolls move together. As the ram reaches the top of the stroke the rolls separate and the boards are released.

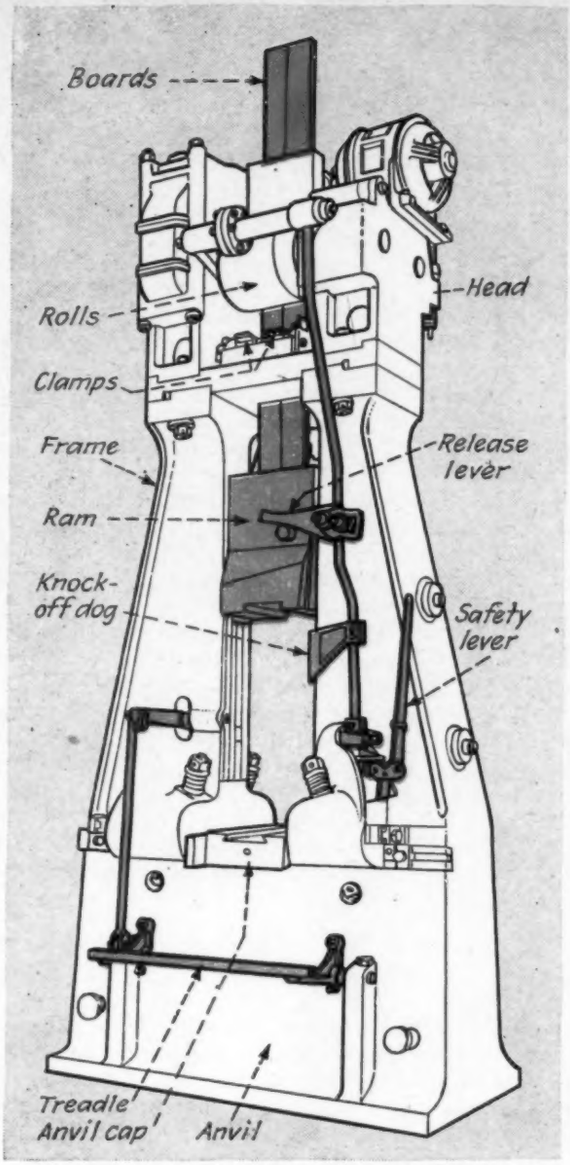
When the treadle is depressed the ram falls at once, but when the treadle is not depressed the boards are held by a set of eccentrics or board clamps so the ram is in position to deliver the next blow when the treadle is depressed. As long as the treadle is held down, the board drop hammer will automatically deliver blows at a uniform rate.

The only way the force of the blow can be varied in a board drop hammer is by changing the distance of fall. This can be adjusted by unclamping and moving the dogs on the front rod, but it is not practical to adjust it during a given operation.

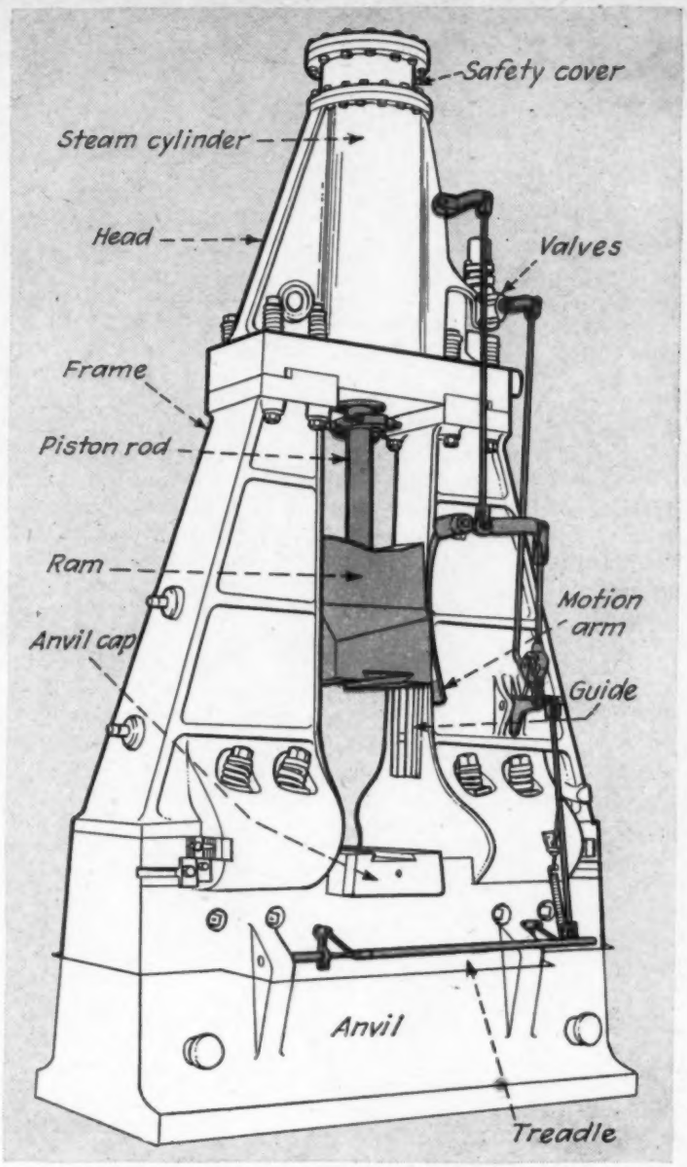
The hammers are rated by the weight of the ram, or falling weight.



Pneumatic motor-driven hammers are powered by individuol motors driving a compressor piston which operates continuously when power is turned on. In this design, air in the ram body is compressed on the upstroke to cushion upward movement; expansion of this air helps drive ram down. Variations include elimination of the ram chamber with pressure applied to entire top of ram piston and a design in which piston is mounted at the center of the ram piston rod with rod guided at both the top and bottom of the cylinder



Motor drives through direct gearing to pair of lifting rolls in this board drop hammer. Other models use motor with V-belt drive or have pulleys for line drive. Large hammers use two pairs of lifting rolls



A 60,000-lb. anvil is used on this 3,000-lb. steam drop hammer. Larger hammers have the anvil cast in sections and assembled with dowels. The anvil is placed on a layer of timbers which are laid on a heavy concrete foundation

This weight may range from 100 to 10,000 lb., but in most commercial forging plants is between 600 and 6,500 lb.

Power is supplied from a line shaft or by an electric motor mounted on the head of the hammer and driving through V-belts or direct gearing. The power required to raise the ram is roughly 1 hp. for each 100 lb. of falling weight.

The ratio of anvil weight to falling weight is about 20 to 1 in most cases. This ratio may be increased for hammers that will work the harder alloys.

Steam Drop Hammer

The steam drop hammer is similar in operation to the steam forging hammer except that frame is mounted on the anvil so top and bottom dies can be held in alignment. Anvil ratios are higher, usually 20 to 1 as with board drop hammers, though the ratio may be 25 or more to 1.

Steam drop hammers are rated by the weight of reciprocating parts, not including the top die. They are made in sizes from 400 lb. to 50,000 lb. although no hammers larger than 35,000 lb. are used in the United States.

The steam operating valve may be rotary or flat-slide type. The throttle valve is usually of the rotary type and can be opened to any point to control the force of the blow. This throttle control is usually made with a treadle so the operator can control the hammer as he manipulates the work. On sizes above about 12,000 lb. control is by a lever operated by a hammer driver as directed by the operator or boss of the hammer crew.

As with steam forging hammers, the steam drop hammers will operate equally well on compressed air. The choice again is usually determined by local conditions.

Gravity Drop Hammer

Recently a hammer has been developed which uses compressed air or steam to lift the ram and lets it fall by gravity as in the board drop hammer. The ram is lifted by a steel rod connecting it to the piston. A separate air circuit operates a clamp which holds the ram in the raised position between strokes. The rate of the gravity hammer is faster than with the board drop hammer. Power consumption is about 60% higher but maintenance is reported to be less and production higher.

FORGING MACHINES

THE FORGING MACHINE or upsetter was developed to gather or upset metal to form bolt heads. This original purpose has been broadened to include a variety of forging work including not only upset but displacement operations.

The forging machine is essentially a form of horizontal double-acting press. In a heavy cast-steel body a stationary and a moving die plate grip the work while a heading tool moves against the stock, forming it into the cavities in the dies. As the heading slide recedes, the dies open. When work requires more than one pass, several cavities are included in one set of dies and the work is shifted to the position for the next pass.

The size of a forging machine is indicated in inches—a holdover from the original bolt-making days. The rating indicates the maximum size of bolt the machine will produce, and gives little indication of either the stock capacity or forging ability of the machine. Sizes range from ½ to 9 in.

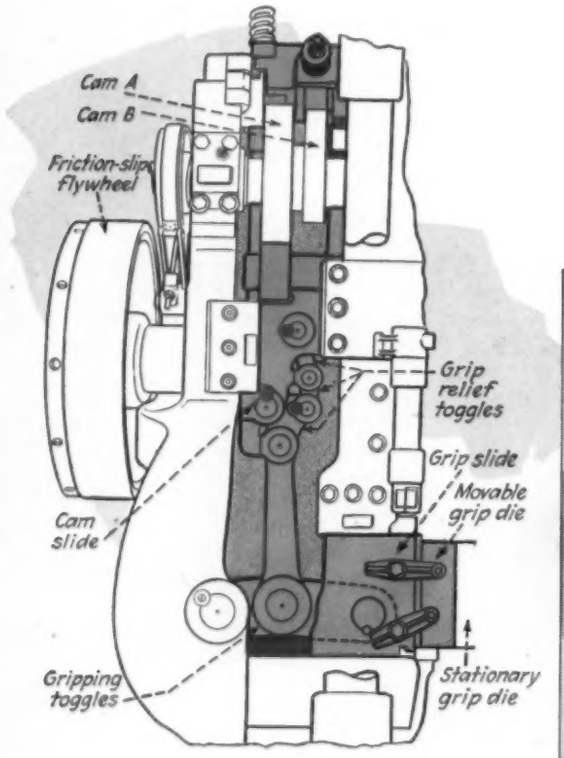
The forging machine is usually powered by an electric motor with a V-belt drive to a heavy flywheel. An air clutch connects the flywheel to the crankshaft from which an eccentric operates the header slide through a pitman. A cam or cams on the crankshaft operate the movable die through a cam slide which by toggle action closes the grip slide. A grip relief on the cam slide releases if stock is misplaced in the dies or for other reasons the dies cannot close. This is designed so that when it relieves the movable die opens at once. The grip relief automatically resets on the next stroke.

An additional safety is provided so that if the header slide encounters an obstruction that overloads it the crankshaft can slip. This relief is incorporated in the clutch on some machines by regulating air pressure at the clutch. On other machines, a separate friction release is provided in the flywheel, which slips at a predetermined load.

Many forging machines (usually called "cold headers") are built for working cold stock. Cold headers are automatic, with stock fed from a reel. In producing items such as bolts or capscrews, one make of machine upsets the head, trims the piece from the bar, rolls the threads, and chamfers the end.

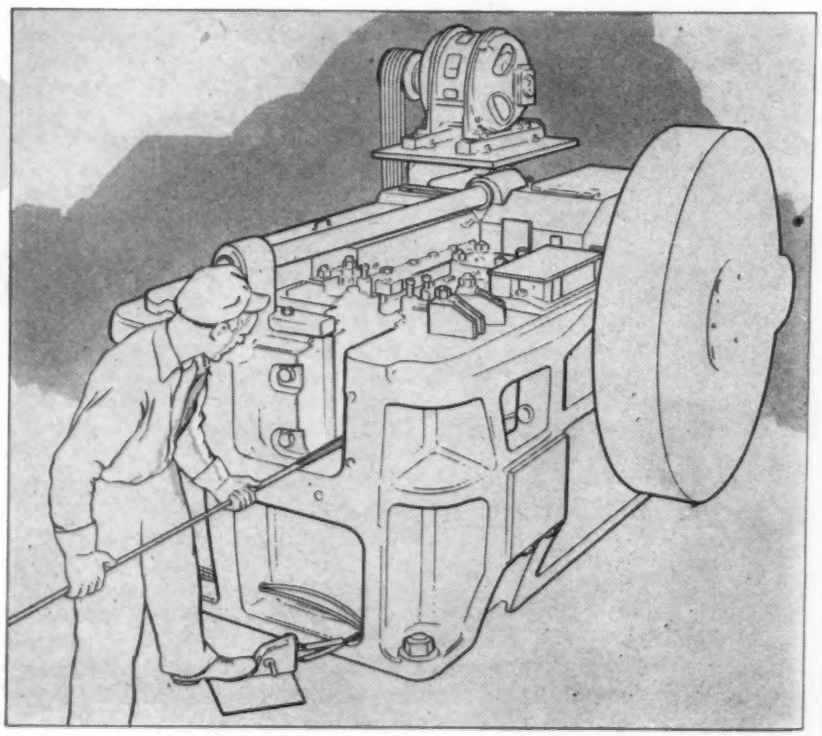
When production is sufficient, hot forging machines can be equipped with transfer mechanisms for automatic operation. In most cases, the variety of work handled makes it necessary to feed and control the machine by hand.

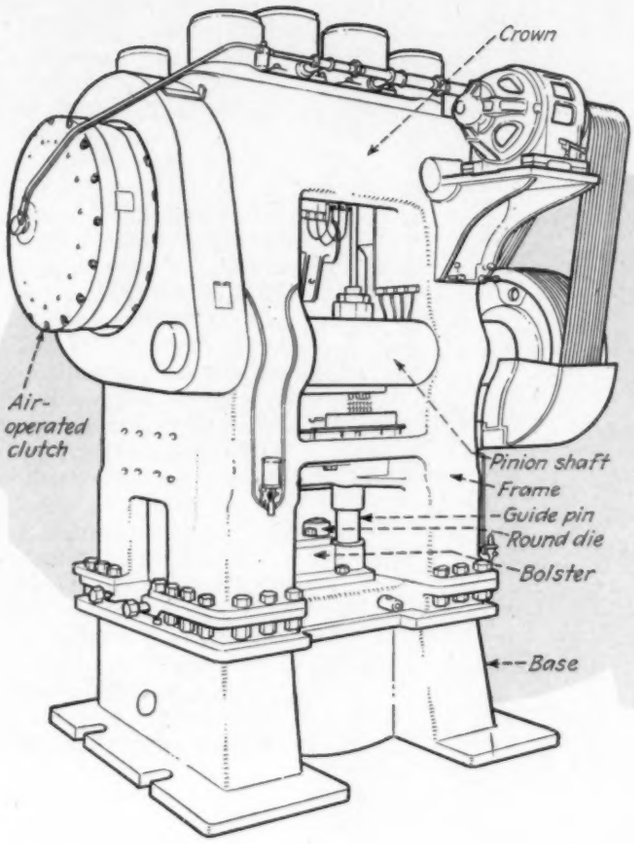
Modern forging machines produce parts in fewer steps than were previously required. Machines in which the bar is sheared from the forging stock and the shear blade backs up the stock for forging allow the use of larger stock and reduce the number of operations. Previously it was the practice to use a bar slightly smaller than the hole to be punched.



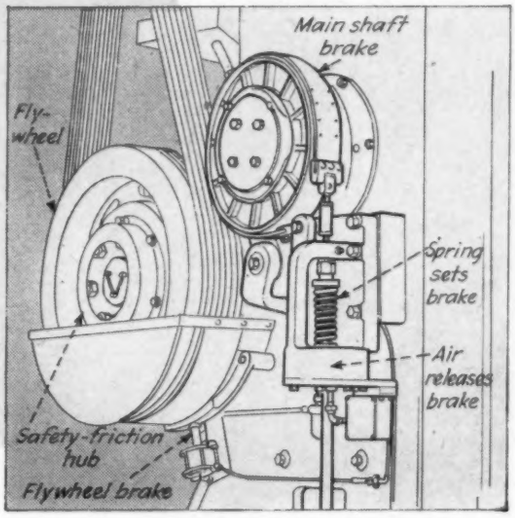
The grip motion, operated in this case by cam A to close the dies and cam B to open them, is transmitted through the cam slide and grip relief toggles to the gripping toggles which transmit movement to the grip slide and movable die. Cam slide moves to position just short of center line so toggle will not rock past center

Bar stock is heated on one end for upsetting in the forging machine. In most cases the stock is handled by hand as it is shifted from one die cavity to the next. Frequently the completed work is sheared or punched from the bar in the final pass of the header slide. This is a 2-in. machine





Large air-clutch mechanical forging press seen from the rear indicates heavy construction used in presses of this type. This press is equipped with bolsters to which die units are clamped. Below: Friction brake on end of the crankshaft opposite the clutch stops ram in raised position at end of cycle. Spring-set brake will function if air supply fails



FORGING PRESSES

PRESSES for forging steel are of massive, rigid construction with steel frames and heavy crankshafts with eccentrics to operate the pitman and ram. Presses on which the crankshaft has a throw are generally not rigid enough for forging.

An electric motor is the usual source of power, driving through gears or V-belts to a backshaft, flywheel, and clutch to the main crankshaft. On small and medium presses, positive clutches of the rolling-key or jaw type, or friction clutches operate the press. Heavy presses use air-operated clutches. The air clutch may serve as an overload release or the press may have a separate relief mechanism. A brake on the crankshaft stops the ram in the raised position at the top of the stroke unless the cycle is to repeat. Additional safety is provided in many cases by a brake on the flywheel which operates when the power is turned off.

Mechanical ejectors or knockouts are provided in the top and bottom dies which are operated by cams and levers. When a longer, more powerful, or delayed knockout is needed on the lower die it can be operated by an air cylinder. The knockout on the top die is not required for most work.

On a mechanical press the speed of the ram is greatest at the center of the stroke. The pressure is greatest, however, at the bottom of the stroke as the pitman reaches bottom dead center. The rating of forging presses, based on the estimated pressure at this point, varies from about 200 tons to 6,000 tons. In some instances no tonnage is ascribed to a press, with the designation limited to a size number. Such ratings are from No. 1½ to No. 10 (producing in one blow in each die impression the size of work regularly handled on 500- to 12,000-lb. steam drop hammers).

One method of comparing the capacity of mechanical presses with hammers is to multiply the tonnage rating by 2 for steam-drop and 2½ for board-drop ratings in pounds. By this method a 1,000-ton press would have approximately the capacity of a 2,000-lb. steam or a 2,-500-lb. board drop hammer.

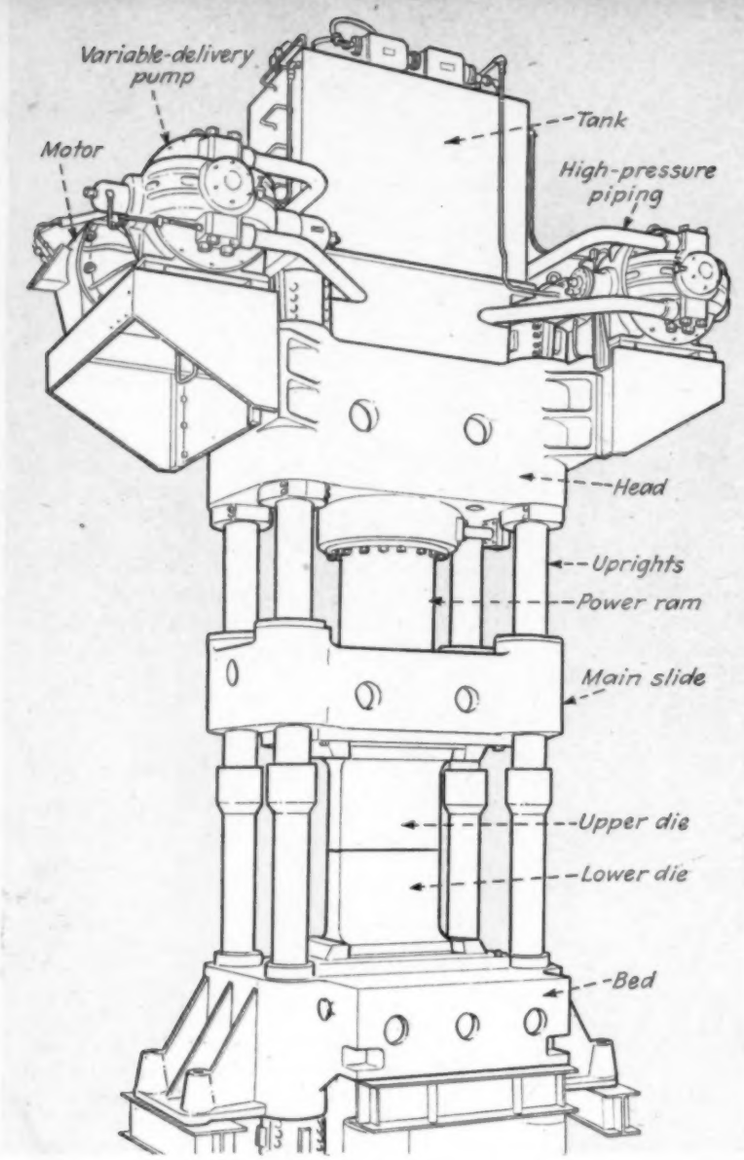
Even when mechanical presses are equipped with friction-relief devices to allow them to stall without damage to the press or dies, the relief must be set to operate only when comparatively high pressure is developed so it will not slip under normal working conditions. This means that under certain circumstances, such as a cold or oversized blank or improper die adjustment, dangerous pressures can be developed. The operator must be careful to avoid such conditions. With proper use the mechanical press will give long service with relatively little adjustment or maintenance.

The nomograph is a guide to selection of mechanical presses up to 2,000 tons for forging and restrike operations. Press capacity is determined from the area under compression and the compressive resistance of the metal for the operation.

The plan area is computed in square inches using the projected area of the finished piece including flash that is in contact with the dies. In determining the compressive resistance, allowance must be made for design and nature of the job.

Hydraulic Presses

Hydraulic forging presses move the ram by the pressure of a fluid. Steam and water are used, but oil is more common in the newer



1,000-ton hydraulic press equipped for flat-die forging has a ram travel of 42 in. Hydraulic pressure is provided by two piston-type generators each driven by an electric motor. Presses with heavier uprights can be equipped with impression dies for upset forging

presses. The hydraulic circuit is designed so the ram has a fast speed for traversing and a slow speed for working. The control is extremely flexible, permitting adjustment of the length of stroke and pressure attained. Frequently the system can be adjusted to reverse automatically when a preset pressure is reached.

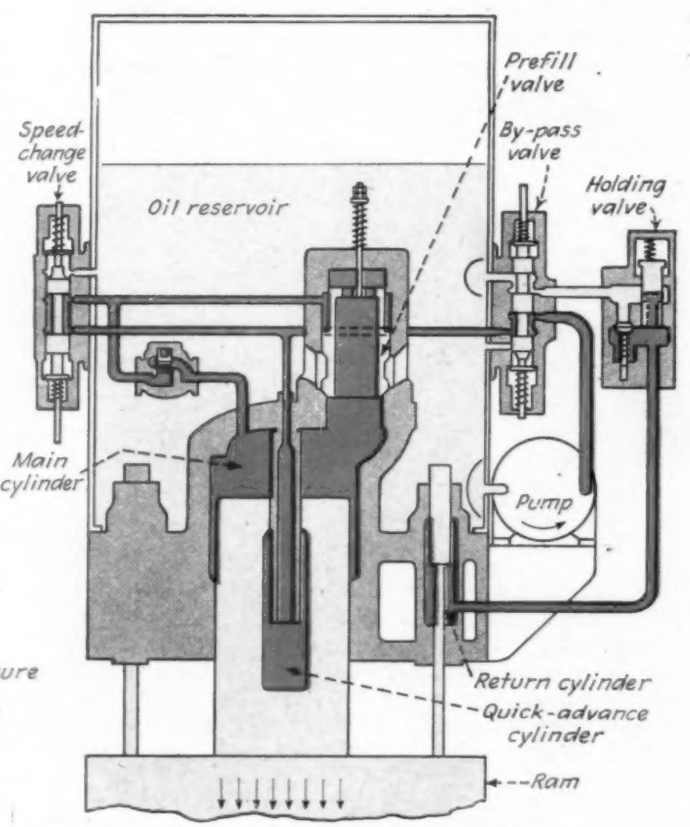
One type of hydraulic circuit is illustrated. In another type a single closed circuit is used with a series of radial pumps the ports of which are connected to the two sides of the press ram. To reverse the ram the eccentricity of the pump plungers in relation to pump cylinders is changed. This method eliminates renewing valves and provides smooth reversal.

On the very large hydraulic presses accumulator bottles are used to build up the pressure. Water is the operating fluid.

A recent development is a Hydro-Screw press which combines hydraulic presure to move the slide with a flywheel, the energy of which can be used on the down stroke. Variable delivery pumps are used and the press will complete a 16-in. stroke and return in 3 sec.

Forging Rolls

Stock can be drawn out to long slender sections in forging rolls. The roll dies are semi-cylindrical. Stock is placed between them when



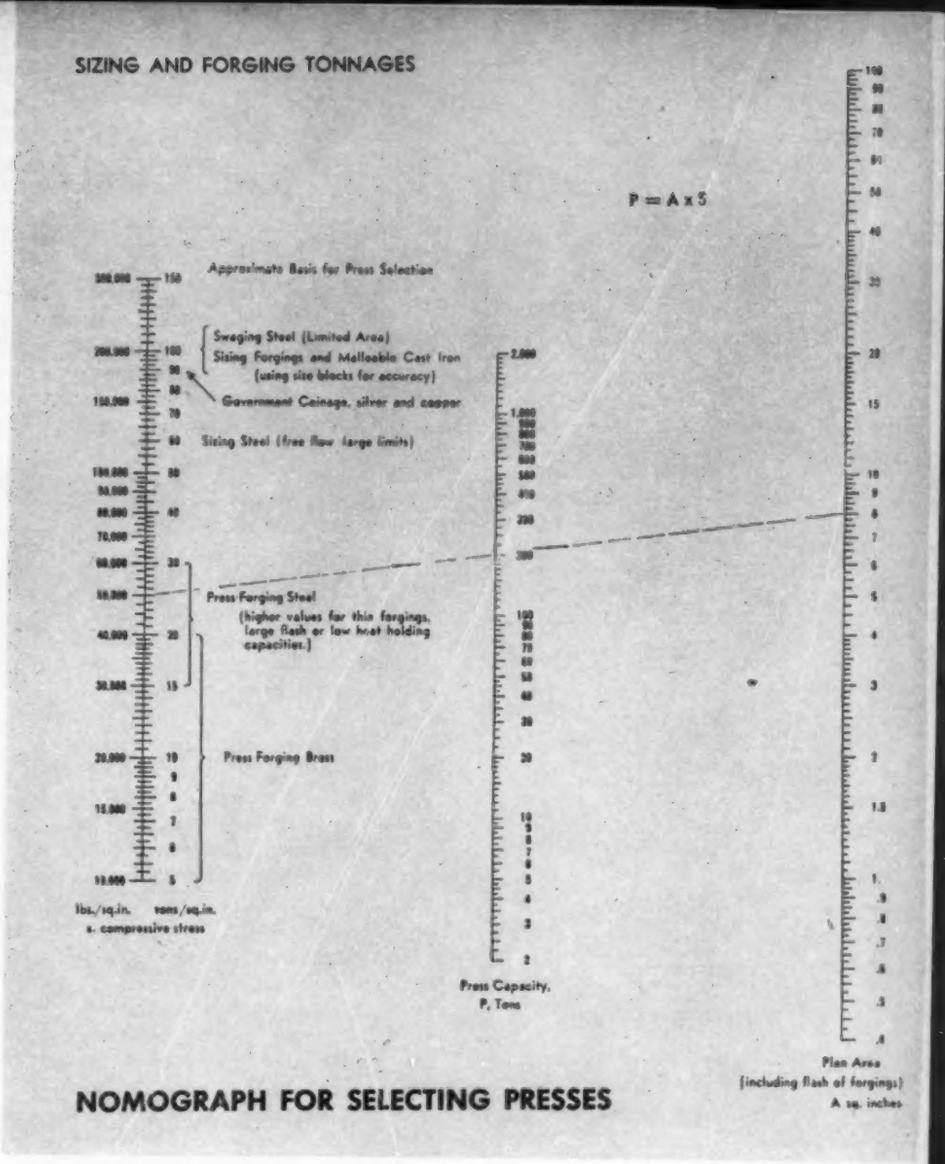
Working stroke in one type of hydraulic press. Pump supplies oil under pressure to main cylinder and to quick-advance ram. Oil escapes from return cylinders through holding valve. During rapid advance and quick return, prefill valve is open permitting free flow between main cylinder and reservoir. When at rest, pump bypasses through pump valve to reservoir and oil is held in return cylinders by holding valve, maintaining the ram in elevated position between strokes

they are in the open position and rolled toward the operator, who again places the stock between the rolls for the next pass.

Straight or tapered work can be forged completely at high speed. Parts such as axle shafts, leaf springs, and automotive shift levers are suited to production in forging rolls. More often the operation is used as a preliminary to finish-forging in a press or hammer. Blanks can be produced rapidly which will reduce the number of subsequent operations.

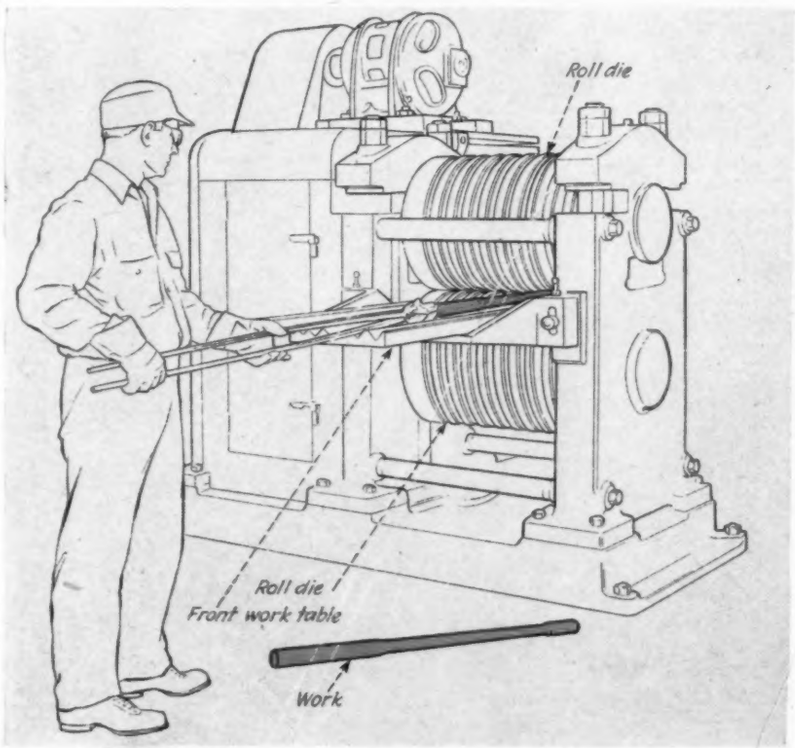
Rolls are driven from an electric motor by V-belt drive through an air clutch. They are made in seven sizes with rolls from 8-in. width up to 45 or more in. The size to use should be selected after discussion with the manufacturer.

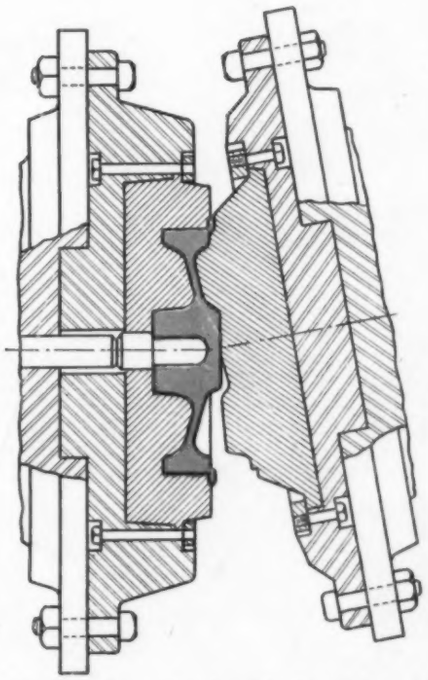
Circular products are rolled between dies in a mill. This form of roll forging is illustrated. The blank is pierced at one end to position it on the vertical die. When the blank is loaded the vertical die advances under forging pressure and both dies revolve. Some upsetting from the initial pressure plus rolling action shapes the work to the die contours. Gear blanks, wheels, brake drums, and turbine rotors are typical of the work produced by this method of forging.


SIZING AND FORGING TONNAGES
P = A x S
Approximate Basis for Press Selection
Swaging Steel (Limited Area)
Sizing Forgings and Malleable Cast Iron (using size blocks for accuracy)
Government Coinage, silver and copper
Sizing Steel (free flow large limits)
Press Forging Steel
(higher values for thin forgings, large flash or low heat holding capacities.)
Press Forging Brass
lbs./sq.in. tons/sq.in.
c. compressive stress
Press Capacity, P, Tons
Plan Area (including flash of forgings) A sq. inches

NOMOGRAPH FOR SELECTING PRESSES

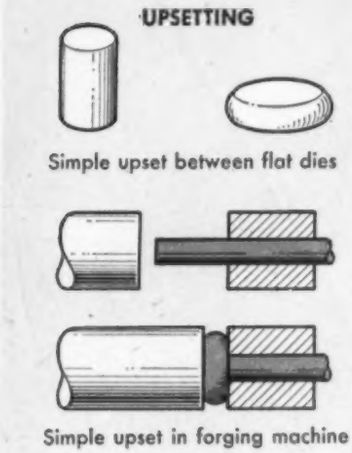
Semi-cylindrical roll dies are held in place on forging rolls by capscrews and can be changed in a few minutes





Roll forging from circular blanks is done between revolving dies. Angle die is fixed and vertical die moves on the end of hydraulic ram

FORGING OPERATIONS



Upsetting. Working metal to increase the cross-section and decrease the thickness or height. The simplest case is hammering a slug between flat dies. More typical is much of the work in the forging machine.

Fullering. The cross-section of part of the stock can be reduced by hammering and rotating the stock in a fuller. It is used as a preliminary operation to adjust the stock volume to suit the impression dies.

Edging. Edging gathers the stock, having the reverse effect to that of the fuller. It is also generally a preliminary operation. In addition to the regular edging dies, rolling and ball edgers are used. Both more nearly confine the metal on all sides. The rolling edger shapes the work into various solids of revolution and the ball edger forms a ball.

Rolling. Metal can be rotated between hammer blows to produce a circular or elliptical cross-section. Rolling can be combined with edging or fullering.

Drawing. Although fullering is really a drawing operation, it is performed at a central section of the stock. Drawing can be performed at one end of the stock between flat dies or in a flat groove. With a groove, diameter is easier to control. Stock is rotated between hammer blows.

Bending. Stock can be bent to desired shape after fullering, edging, or drawing to form work that is not symmetrical.

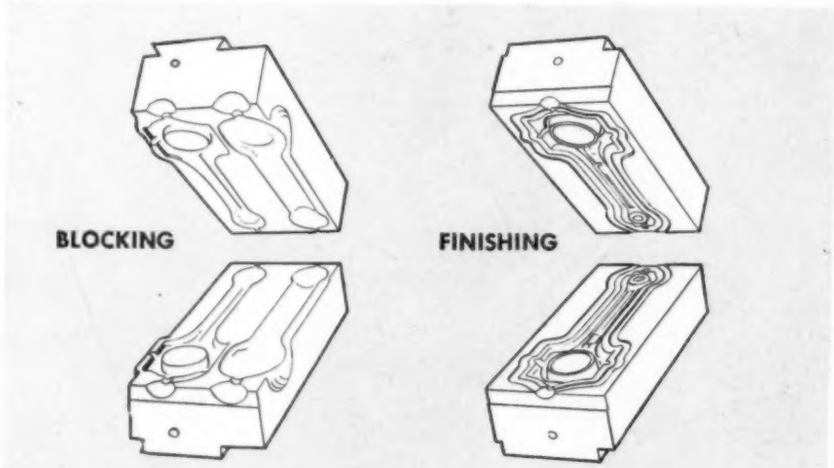
Blocking. The blocking impression has the general shape of the finished part, but details that might obstruct metal flow are omitted and corners are thoroughly rounded. Blocking may be used to shape the metal to roughly finished form when the part is too complex for finish-forging after the preliminary operations, or it may be used to reduce wear on the finishing impression, or both. Sometimes more than one blocking, or breakdown, operation is required.

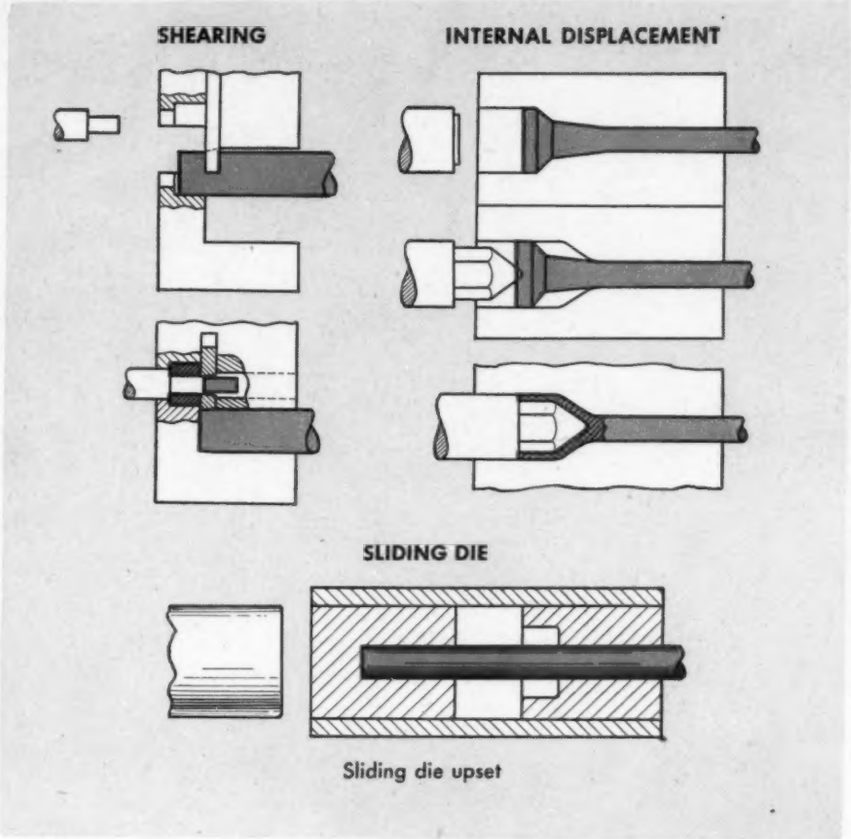
Finishing. The finishing impression forms the metal to the final size and shape. In some cases there may be bending or drawing operations after the finishing impression.

Internal Displacement (in forging machine). Stock is moved from the center of the bar outward by a piercing punch operating against the end of the bar. This permits forming many parts with smaller initial stock diameter than would otherwise be possible. Many parts, such as gear blanks and pipe couplings, are removed from the bar by punching, the wad remaining on the end of the bar and entering the next forging.

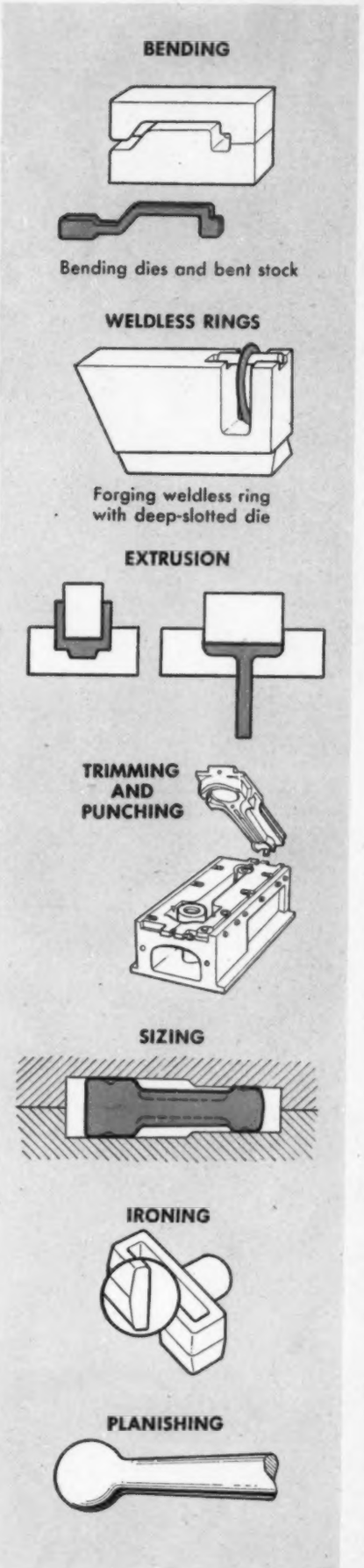
Shearing (in forging machine). The amount of stock required can be sheared from the end of the bar as the grip dies close in the forging machine. The shear blade then backs up the work while it is upset. When the grip dies open, the completed piece falls from the dies.

Sliding die upset. Where an upset is required at a point not at the end of the bar, the stock is gripped in a die with stationary and sliding sections. The header ram moves the sliding section, upsetting the block in a cavity in the sliding or grip dies or both. When several passes are required, the cavities are alternated between sliding and grip dies. It is possible to have more than one sliding section and complete camshafts have been upset.





Sliding die upset



Bending dies and bent stock

Forging weldless ring with deep-slotted die

Weldless Rings. With a deep-slotted saddle, weldless rings are produced on steam hammers. A cut piece of stock is flattened and punched, then placed on a mandrel and rolled with each blow of the hammer to produce a ring of the desired size.

Extrusion. A slug of material can be placed in a die cavity and struck with a punch to extrude the metal upward around the punch or downward through an orifice in the die. The first method is widely used with metals such as tin, lead and aluminum to form collapsible tubes and has recently been applied to steel. The second method can be used with steel for forming parts such as valves. Mechanical or hydraulic presses are employed.

Trimming. Flash is trimmed from forgings, hot or cold, in mechanical presses. The trimmer dies can usually be flat, but for some parts are contoured to provide the necessary bearing area on the lower die.

Punching. In most punching operations the forging is held stationary and the slug is pushed out by a punch. In some cases it is combined with trimming and the forging is pushed over the punch.

Restriking. Completed forgings may be restruck in a press or hammer for a variety of reasons. The operation is done either hot or cold, depending on the purpose of the restrike.

Sizing (also called coining). Heavy pressure is exerted on some portions of the forging, such as bosses, to bring them into accurate alignment and reduce or eliminate machining required. A mechanical press, hammer, or bulldozer can be used. The work is usually sized cold or heated below the scaling point.

Ironing. Where straight sides are required on one surface of a part, the draft can be shifted from this side by ironing. Thus if the draft were 6° on each side, after ironing it would be 0° on one side and 12° on the other. Ironing is also used to produce smooth surfaces. Ironing is done in a press either hot or cold depending on the material and the amount of metal movement involved.

Planishing. Rolling a symmetrical forging in a pair of dies mounted in a press with a short, fast stroke will remove the trim line, smooth the entire surface, and reduce the variation in dimensions. It is usually done cold or at a low heat.

Straightening. Forgings which are warped or bent beyond allowable limits can be straightened in a press or bulldozer. This is generally done cold or at a low heat and is essentially similar to sizing.

DIE MATERIALS

WE ACKNOWLEDGE . . . the valuable assistance in collecting the data for this report given by the following firms and organizations. Thanks go also to Waldemar Naujoks, author of "Forging Handbook," for his help.

The Ajax Manufacturing Co.
Aluminum Co. of America
The American Brass Co.
Bethlehem Steel Co.
The Billings and Spencer Co.
E. W. Bliss Co.
Brass Forging Assn.
Chambersburg Engineering Co.
Drop Forging Assn.
Erie Foundry Co.
A. Finkl & Sons Co.
Hydraulic Press Mfg. Co.
Lobdell Co.
Mueller Brass Co.
The National Machinery Co.
Revere Copper and Brass Inc.
The Steel Improvement & Forge Co.
The Timken-Detroit Axle Co.
Waterbury Farrel Foundry & Machine Co.
Wyman-Gordan Co.

IN GENERAL the speed and efficiency of the forging operation is limited by the stamina of the die block. The steel used in the die blocks must resist heat, abrasion and pressure. They must withstand severe strains, have long wear life, minimize cracking and checking, and have a long life under high-production conditions.

The majority of die blocks are heat-treated before machining the impressions. This avoids the danger of cracking or warping after the impression is machined and eliminates a cleaning and polishing operation.

Carbon-steel die blocks are satisfactory for short runs where initial die cost is a serious factor. They can be obtained heat-treated to 34-29 scleroscope or annealed.

Alloy-steel die blocks are obtainable in chromium-nickel, chromium-molybdenum, and chromium-nickel-molybdenum types. Of these three the last is the most satisfactory for the majority of applications.

The chromium-nickel-molybdenum die block is obtainable in four grades oil-quenched and tempered and also air-quenched or annealed. The maker of the die block is best qualified to recommend the grade for a particular forging.

Generally the A hardness is for shallow impressions (up to ⅜ in. depth) of a regular design with a cross-section not over 10x16 in. B hardness is applicable to impressions up to 1 in. depth where design is not too intricate and area is not over 100 sq. in. or length over 30 in.

Blocks with C hardness are suitable for impressions up to 3-in. depth and of more intricate design. They should be no more than 100 sq. in. in cross-section and not over 6 ft. long. D hardness is suited to deep impressions and intricate shapes. It is more durable than the other blocks but will wear faster on the impression face.

Air-quenched blocks are suitable for large heavy sections or for blocking operations. The annealed block is machined, then heat-treated, and will produce unusual hardness for forging small, flat parts to extremely close tolerances.

The chromium-molybdenum type has applications for simple forgings with limited runs. It is quite satisfactory for well-balanced shapes or for blocking dies. It is furnished heat-treated to 42-36 scleroscope or annealed.

For forging machine dies the chromium-nickel-molybdenum die block is generally used for gripper dies. The B hardness is recommended for blocks up to 60 sq. in. in cross-section and the C hardness is recommended for larger sizes.

Die inserts are sometimes used where a high-alloy steel is needed for one impression or a part of an impression. For forging in drop hammers, inserts must be used with extreme care. Improper seating or uneven surfaces may cause the insert to break under the hammer, causing serious injury to hammer operators. High chromium-high tungsten alloys, or almost any other type can be used for inserts. Keys may be used to hold the insert in place or it may be a shrink fit in a cavity in the die block.

On press forgings, die inserts are readily employed with little danger of breakage.

For trimming dies, the punch should be of a tough steel and the blades of a hard steel which will resist wear and heat. Carbon steels are sometimes satisfactory when the flash is thin and the quantity small, but for most conditions tool steel is desirable. The same general conditions prevail for punches except that cutting edges should be provided on both punch and die.

For sizing operations a tough, hard die steel is required. A good grade of hot-working steel is needed for hot sizing and a water or air hardening steel for cold sizing.

For other restriking operations, almost any grade of steel from plain carbon to high-grade tool steel may be most satisfactory, depending on the severity and quantity.

Typical Composition and Heat-Treatment of Die Blocks

No.	Purpose	C	Mn	Cr	V	Mo	Ni	Annealing °F	Hardening °F	Quenching Medium
1	Hot forging	0.60	0.70					1400-1450	1425-1475	Water
2	Hot forging	0.70			0.25*			1360-1400	1475-1525	Water
3	Cold forging	0.85						1360-1400	1425-1500	Water
4	Impression dies	0.60	0.70	1.00	*		1.50	1400-1425	1475-1550	Oil
5	Impression dies	0.60	0.70	0.90		0.20		1400-1425	1475-1550	Oil
6	Impression dies	0.60	0.80	0.75		0.25	1.50	1400-1450	1475-1550	Oil
7	Impression dies	0.60	0.70	1.15	0.15	0.50		1400-1425	1500-1575	Oil
8	Impression dies	0.60	0.60	0.90	*	0.70	1.75	1400-1425	1575-1650 1500-1525	Air Oil

*optional

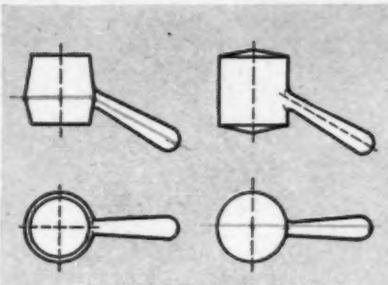
Typical Standard Heat-Treated Conditions

Temper	Brinell	Scleroscope	Rockwell "C"
Hard*	477-444	66-61	49-46
1* or A	429-388	60-55	45-41
2 or B	375-341	55-50	40-36
3 or C	331-302	50-45	35-32
4 or D	293-269	45-40	31-28

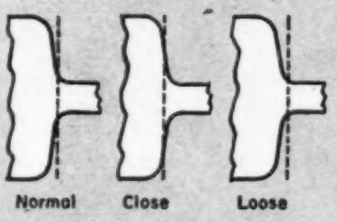
*Drop hammer blocks furnished with soft shanks

0.60 C. Alloy Annealed Blocks

Approximate Hardness After Heat-Treating		
Tempering Temp. °F	Brinell	Scleroscope
600	493	68
700	444	62
800	388	55
900	341	50
1000	285	43

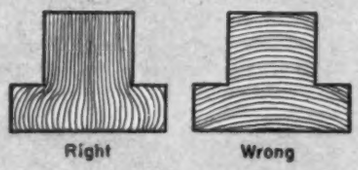


Parting line can be placed in two positions on this part. Method at the left requires offset dies, while method at the right permits flat dies and uses the natural draft of the round section

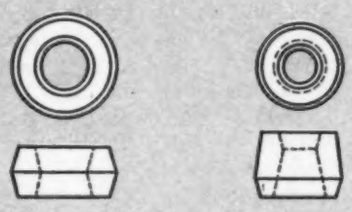


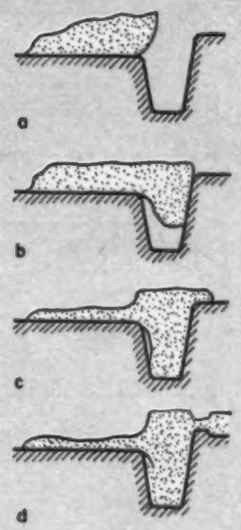
Flash is ordinarily trimmed from the forging with type of trim at left above

Direction of grain flow in this gear blank depends on how stock is placed in the die. Method at the left uses slug cut from bar stock placed upend in the lower die, gives maximum strength in the gear teeth



Draft is applied to both exterior and interior surfaces, but interior surfaces need not have the same parting line as used on the outside of the part





Coldshuts occur when metal folds back upon itself. The result is a weak spot in the metal. In this case, metal is being forged into a cavity in the lower die. Too sharp a corner on the die prevents smooth metal flow, causing metal to fill the bottom of the cavity first

DIE DESIGN

FIRST STEP in planning forging dies is to be examine the design of the part to be forged. Some alteration will be essential and, if permissible, additional changes may substantially reduce the cost.

To begin with, a parting line must be selected and draft applied to the part. Draft is the angle of taper of surfaces which would normally be vertical to permit easy removal from the dies. If possible, the parting line should permit the use of flat rather than contoured dies. In selecting parting line and position in which stock will be placed in the dies, the resulting grain flow must be considered.

On drop forgings, the standard amount of draft is 7°. Some hammers of recent manufacture are said to permit draft as low as 1½°, but users claim small draft angles cause more rapid die wear and increased likelihood of work sticking if there is even slight peening over of the dies. General practice is still to allow 5 to 7° for drop forgings.

On machine and press forgings, it is perfectly possible to use no draft at all. However, the commercial standard is to allow 3°.

Parts with circular or elliptical cross-section obviously require no draft and where such shapes can be used they will be easier to forge and die life will be greater.

Interior surfaces require more draft than external surfaces because of the tendency of the part to shrink around the die as it cools if several blows are to be struck. Commercial standards are 10° for drop hammer and 5° for upset forgings.

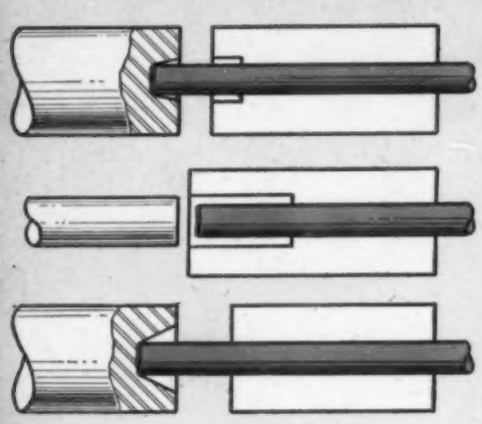
After draft is applied, corners should be rounded, radii on outside corners and fillets on inside corners should be as great as part design will permit.

Drop and press forgings will usually have flash on the parting line which must be trimmed off. This may receive a close, normal, or loose trim, and the type of trim must be determined. As the name indicates, normal trim is customary. In some cases a close trim is relatively easy to make and in other cases it may seriously complicate the forging operations.

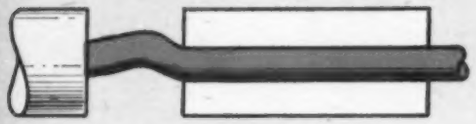
Because dies wear with use there will be some variation in parts as a result. Other variations may occur because of mismatch of the dies, variations in temperature of the material, or other causes. The selection of tolerances for a part is a major factor in determining forging cost.

In some cases, liberal tolerances may be acceptable and will substantially increase die life, may reduce the number of operations and the percentage of rejects. All of these will reduce the forging cost. In other cases close tolerances, while increasing forging cost, will reduce or even eliminate machining at an ultimate saving. The number of forgings produced to extremely close tolerances is increasing, especially with materials or designs which are difficult to machine. Restrike operations are commonly employed when close tolerances are desired. Standard tolerances for drop forgings have been adopted by the Drop Forging Association. They are classed as "Commercial Standard" and "Close Standard."

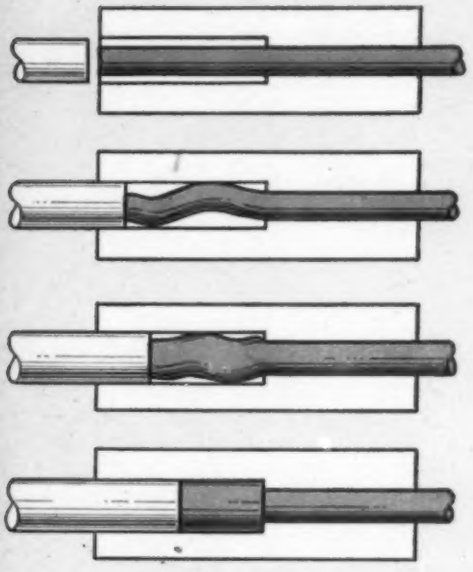
When some surfaces of the forging are to be machined, additional metal must be included. This allowance for



Application of Rule 1

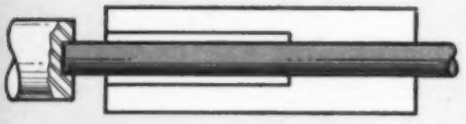


Violation of Rule 1

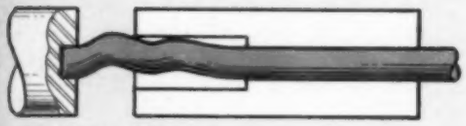


Application of Rule 2

Violation of Rule 2



Application of Rule 3



Violation of Rule 3

machining may be as little as 1/32 in. on small forgings or as much as ½ in. on large ones.

When the part has been adapted to suitable forging design, the actual die design can begin. The number and sequence of operations is determined, the dies are planned for each operation, and frequently for drop and machine forgings impressions for several operations will be combined in a single set of dies.

For drop forgings, it is customary to place the finish impression as near the center of the die as possible because the greatest force is required for this operation. Forging machine dies usually work progressively from the top down. For press work it is rare to include more than one impression in one die set. Smaller dies can be used and several sets can be mounted on the bolster plate at one time. In this way individual sets can be replaced when they are worn without having to make new dies for the other operations.

Unless the part is extremely simple, templets are designed for each impression before die-sinking begins.

Drop-forging Dies

Die blocks are drilled with holes into which handling pins can be inserted. Blocks are then paired and the shank planed to suit the hammer on which they are to be used. Blocks are turned over and machined parallel to the face of the shank, removing about ¼ in. to provide a clean, sound surface for the impressions.

Two edges (designated the match edges) are then machined at right angles to the face and to each other. This may remove metal about ¼ in. inward and 1 in. downward. All measurements are made from the match edges. When dies are mounted in the hammer, these match edges are aligned.

The finishing impression is machined first. It is laid out on the die face from the templet and the impression machined using the die sinker or other machine. Round impressions of simple design can be machined in a lathe or boring mill. A drill press or radial drill is sometimes used. Bench work follows, including scraping, filing, grinding and polishing.

Templets or a model of the part (called a "type") are used to check the work. To use the type, the impression is coated with Prussian blue and the type is inserted. The die maker strikes the type with a hammer, then removes it. Where high spots exist, the dye has been removed. Additional bench work to remove the high spots is followed by another typing operation. The process is continued until even bearing is obtained.

When the finish impression is machined the die blocks are clamped together and a lead cast is made by pouring molten die metal through the sprue. This lead cast is checked for dimensions. In making these measurements, allowance must be made for the fact that since the lead cast cools in the dies normal shrinkage may be prevented by the die. Deep cavities, plugs, or sudden changes in width may prevent normal shrinkage.

The lead cast can be used as a check on the weight of the finished forging by correcting for the variation between lead and the metal to be used.

A gutter for flash is machined around the finished impression. Impressions for preliminary operations are machined in the blocks. A cut-off can be milled in one corner of the blocks or inserted in a slot machined in the side of the block.

Impression faces are carefully lapped and polished to remove tool marks. These marks will cause blemishes on the forging and also reduce the life of the dies.

The final step is to mill dowel holes into the shanks. If the dies have been made from heat-treated blocks they are then ready to use. If made from annealed blocks, the dies must be heat-treated, after which an additional polishing will be necessary.

Forging Machine Dies

Two body blocks and a set of punches comprise the usual set of forging machine dies. Certain definite laws governing their design have been developed by E. R. Frost*, and have been generally accepted.

Rule 1. The limit of length of unsupported stock that can be gathered or upset in one blow without injurious buckling, is not more than three times the diameter of the bar.

Three diameters is the actual limit, so in practice 2-2½ diameters is used. This rule holds true whether the upset is in the open or in a cavity in the punch or grip dies, or both. Stock that is too long will bend rather than upset, whether in the open or in a cavity.

*Mr. Frost is president of the National Machinery Co., Tiffin, Ohio. This company publishes an illustrated booklet describing these laws.

Rule 2. Lengths of stock more than three times the diameter of the bar can be successfully upset in one blow, provided the diameter of the upset made is not more than 1½ times the diameter of the bar.

Again the rule indicates the limit and in practice 1.3 times the diameter is used as the maximum. Since stock will buckle near the center, more than half the stock should be inside the die cavity at the start of the upset. The amount upset by this method can be increased by making the first impression square or by increasing the cavity near the grip die beyond the limit.

Rule 3. In an upset requiring more than three diameters of stock in length, and in which the diameter of the upset is 1½ times the diameter of the bar, the amount of unsupported stock beyond the face of the die must not exceed one diameter of the stock.

If the diameter of the hole is reduced the length of unsupported stock can be correspondingly increased. For a 1¼-dia. hole, unsupported stock may be 1½ diameters. Since this provides limited travel of the heading tool, taper upsets are frequently used. A good angle of taper is 4°. Using a taper, rule 2 applies to the mid-point of the taper.

When designing for sliding dies, these three rules apply. In this case, unsupported stock refers to the stock between sliding and grip dies.

Once the necessary sequence of passes is established, the body blocks (or grip dies) and punches can be designed. Perhaps the most common practice is to locate the passes in sequence from top to bottom, where work is to be handled by hand though some designers prefer to work from the bottom up. In some cases where unusual pressure is required for the final pass, it is located at the center to receive full pressure of the header slide without tending to distort the punch. Other operations will then be in sequence above and below.

Body blocks are planed on all six sides to provide accurate fit in the die space. No shank is machined because dies are clamped in position. Impressions are then marked on the die faces and machined and polished in the same manner as described for drop-hammer dies. Dies are usually made from heat-treated blocks.

A punch is required for each impression in the dies. These are generally turned from annealed stock, then hardened and ground.

Frequently, individual die blocks will be used for each step in machine forging. These are keyed to maintain alignment when clamped in the forging machine. This arrangement simplifies replacement if dies wear faster on some steps than on others. Inserts of high-heat resisting steels are customarily used at points of maximum wear to obtain longer die life.

Press Dies

Initially press dies were often dies which had been designed for use in drop hammers. Such dies are still used occasionally but in most cases they are less satisfactory than dies designed and made for pressing. Press-forged parts have little or no draft.

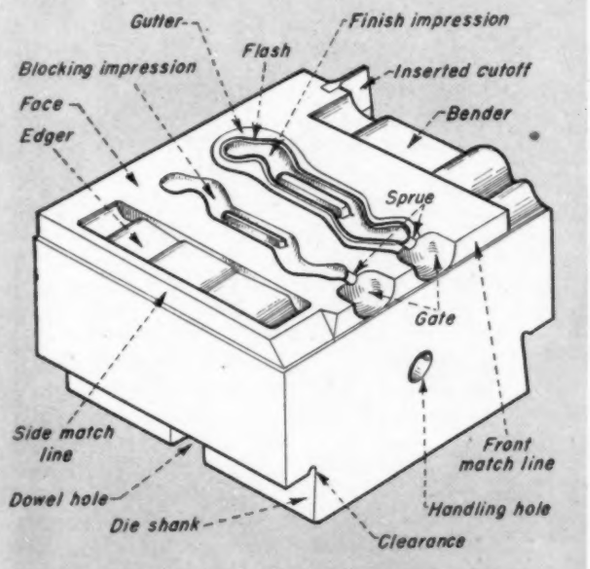
When designed for the press, dies rarely have a shank. A groove may be machined in the side to facilitate clamping to the press or a section can be machined down and drilled for bolting in place. Separate die blocks are customarily used for each impression.

Originally the parts forged in presses were those which could be upset in a single stroke of the ram. Now more complex parts are forged and the steps must be planned as in any other forging. Most press forgings are still solids of revolution, or nearly so, and these are usually made from slugs cut to size and placed upright in the lower die.

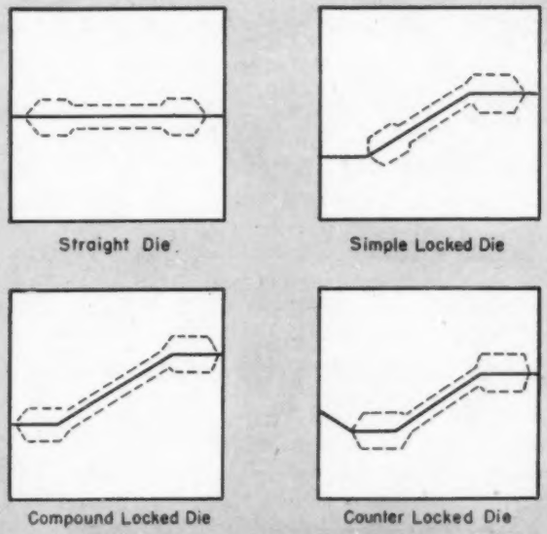
Although it is unlikely that the limits set down in the laws for forging-machine upsets would be exceeded in such press forgings, the designer must remember that they apply to upsets in presses as well as forging machines.

Die blocks are usually a high-quality heat-resisting steel. Aside from the differences mentioned, the procedure for layout and machining of the dies is similar to that for drop forgings. Leader pins will aid in maintaining accurate die alignment. Dies are frequently made as small inserts which are press fitted into blocks.

Scale is a major problem in press



Elements of a die block for drop forging



Straight die is preferable. Side thrust is present in locked dies and may be present in compound locked dies. Counter lock prevents side thrust

forging. With a hammer the scale is broken loose on the first blow (before the metal closely fits the dies) and most of it is shaken off the dies by vibration. Some scale will settle in the lower die, causing it to wear more rapidly, but in general, scale is not a serious cause of die wear. On the press, the scale may be forced into the die faces under heavy pressure on the first stroke.

Unless work is relatively free of scale when delivered to the press (through use of controlled-atmosphere furnaces or induction heating) it is advisable to provide a flat die surface of suitable height where a preliminary press stroke can upset the metal slightly. This will break the scale and cause it to fall free as the work is moved to the first die position.

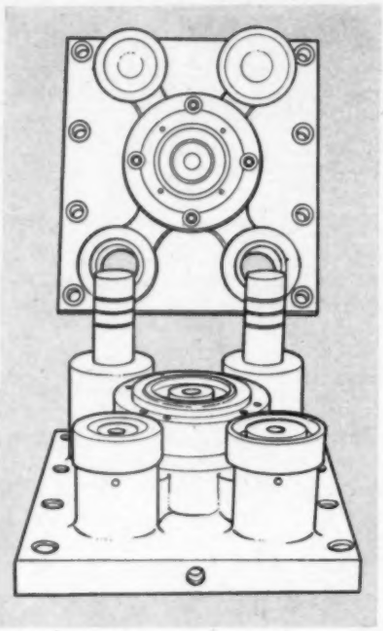
When several dies are mounted on a press at one time to provide a sequence of operations, the finish die should be as near the center of the press bed as possible. Preliminary impressions can then be placed on either side of it.

In some cases where production is high extruded shapes can be used as the stock from which forging slugs are cut. This may eliminate preliminary operations and reduce the amount of flash.

Die Wear

Die costs are a major part of the cost of the forging and the life that can be obtained from the dies has an important influence on the methods selected, the die design, and forging procedure used.

The principal factors causing die wear are heat, abrasion and pressure. Heat is the most serious, being influenced both by forging temperature and time of exposure.



Dies for producing ring gear blanks in a mechanical press are made up of separate sets for each operation mounted to a bolster plate and guided by leader pins. First operation upsets the blank, second blocks it to approximate size and shape, while the third die finish forges it to a close tolerance

Forging pressure in some cases may cause breakage of hard dies and if too hard a die is used for the operation, breakage may be a serious problem.

Abrasion from movement of the metal varies with the material forged. In most alloys the abrasive effect is not serious unless the metal is underheated. With some of the high-temperature alloys now being forged, abrasion becomes a major cause of die wear. If scale collects on the dies and is left there, it will cause severe abrasion.

Heat is the most serious cause of die wear and the one which deserves the most attention. The length of time the metal is in contact with the dies influences the life of the dies considerably. Almost invariably this time is greater in the lower die and wear is greater there.

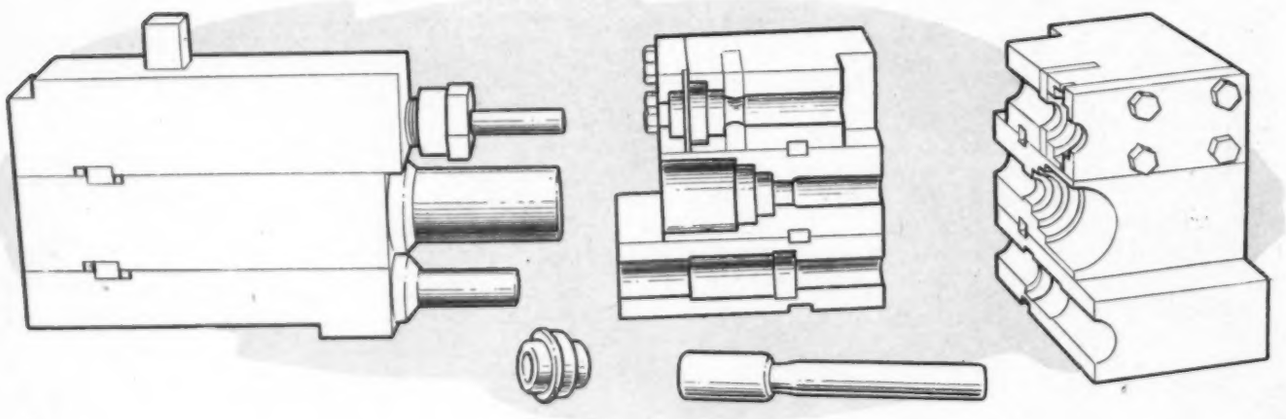
Good die design will always be necessary for good die life. If too much forging is attempted in one impression, if the metal is improperly distributed when the work arrives at the impression or is improperly seated, or if the die has sharp corners, it is evident that die life will be relatively short.

No standard for die life can be set It may vary from as little as 200 pieces for a part of unusual difficulty to as much as 20,000 or more and be considered normal for the operation. Material forged influences die life; on some non-ferrous alloys life is much greater.

Another factor that will influence die life is the quantity forged at one time. The process of positioning dies at the beginning of a run imparts appreciable wear. If small lots are forged the dies may have only 10 or 15% of the life possible if they are used continuously until worn out.

The second report on forging, which will deal with the forgeable materials and the procedures for handling them, will discuss variations in die materials and design required for each material.

Set of dies and punches for producing a gear blank in the forging machine. Stock is gathered in the bottom groove, upset to final dimensions in the center and punched from the bar at the top. The wad punched from the work remains on the bar and is used in forming the next piece



TALKING SHOP

What, Not Foolproof?

THAT combination locks for bicycles and other personal property, mechanically perfect though they may be, give no guarantee against temporary amnesia is the theme of a graphic 8-page letter sent to the biggest hardware manufacturer in the country.* "I don't see how any thief can beat these locks," said the lady, "when its rightful owner can't get an even break. Friday night my son forgets to put the lock on his motorcycle, so I do it. Saturday morning he wants to use it. By that time I have forgotten the combination. It takes three of us until Sunday night to get the thing open. We tried 10,559 combinations. Is there anything you can do to prevent this sort of thing?" The president of the company is saving that letter as a trophy—or a testimonial.

Multum in Parvo

IN ONE PLANT they had just mechanized their 8-press forging setup, reducing space, speeding the cycle and lowering manpower requirements. Formerly it took 2½ men per press to handle the jobs. Application of induction heating to the job provided enough mechanization and improved materials handling so one man now turns out (indirectly of course) about 50% more than the 2½ did. After the new setup was in operation, the production superintendent discovered that none of the men previously on the job was good enough to take over. The new man had to be trained maintenance man, capable of handling the electronic control board for the induction-heating units. Any breakdown here would slow up the whole cycle.

The lesson here may be profitably applied by other companies who are switching to high-frequency units to speed production. In nearly every case, they will reduce the number of operators, but will have to give specific training to personnel replacements.

Form-Tool Grinding

SO MUCH DEVELOPMENT has occurred in automatics, especially those specifically designed to handle carbide tooling, that form-tool grinding is assuming new importance. Tools must be reground more frequently because the newer high-speed machines turn out the run per grind in much less time. Not so long ago, tools lasted for a shift; now it is common to find that tool changes may be needed once an hour or less. And so-called rough machining is being done to such close dimensional tolerances and to such a high degree of finish that any subsequent grinding may be more in the nature of sparking out than customary finish grinding. So watch for important developments in methods for form-tool grinding.

Square-jawed Phooey!

RED-HEADS are not all quick-tempered, chinless people are not all weak and lacking in drive, and square-jawed persons are not all aggressive, according to Dr. David W. Cook, asst. director of industrial relations, General Aniline & Film Corp. Speaking before the AMA in Chicago recently, Dr. Cook said: "Scientific studies prove such generalities are the bunk. Many redheads are weak and vacillating, and the number of chinless successes in business refutes the old theory that chinless persons are unfit for leadership. Thousands of square-jawed persons have as much aggressiveness as a canary bird."

Dr. Cook calls phrenology, graphology, palmistry, astrology and physiognomy "psychological gold bricks" in hiring men. Psychological testing, in conjunction with other methods of employee selection, has proved helpful, however, he says.

Pressing Cold Steel

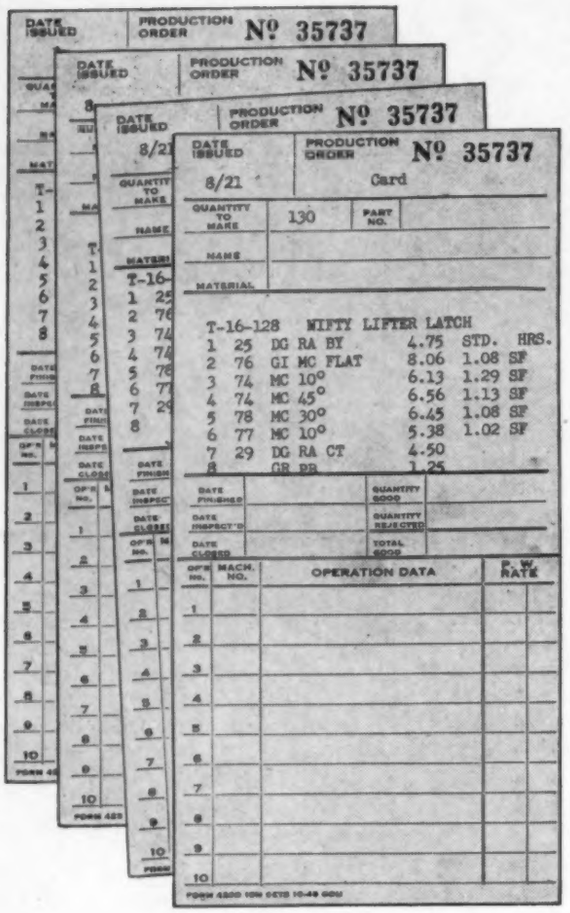
STEEL cartridge cases, aircraft parts, fuze bases, etc. were pressed cold in Germany during the war. Pressures ranging up to 115 tons per sq. in. force the metal to flow in the die, friction being cut by bonderizing the material. W. W. Galbreath of the Office of Technical Services, U. S. Dept. of Commerce, believes the process is applicable in making wire, cold-drawn pipe and stampings—and at considerable savings.

Cutting Speed Unlimited

BEARING LIFE, rather than so-called limitations in cutting speed for a given material, is emerging as an important factor in the operation of high-speed equipment designed for carbide tooling. Recent experiments in machining a tough alloy steel indicated that the cutting speed was not so important as thought, and that speeds in excess of 1200 sfpm. were entirely suitable with respect to tolerances and finish. But the load imposed on the bearings by stock whip at these speeds made it impractical seemingly to get out of carbide its maximum potential in respect to cutting speed.

Advisory Committees

WM. DOLLE, president, Lodge & Shipley, has been meeting regularly with the shop's 60 foremen, to discuss mutual problems, company position, etc. But he found the 60-man meeting too large—many foremen were embarrassed and kept mum. Now he holds four 15-man meetings and finds much more spontaneity and willingness to talk up. One of the jobs of these groups, as a part of management, has been to examine and recommend desirable changes in the union contract.



CODED STENCILS SIMPLIFY PRODUCTION CONTROL

Stencilled data to eliminate transcription errors, combined with control boards and daily machine schedules to permit a follow-up on parts in process, bridges way to simplified control

Stencils for marking operation data and time allowances on stock production orders eliminate transcribing errors. A two-letter code permits detailing of work for each operation. The lower part of the form is used by the methods engineer for operations not yet standardized

BY O. M. LUND
WORKS MANAGER
BARRETT-CRAVENS COMPANY

PRODUCTION ORDERS for stock parts, when quantities reach the minimum ordering point, usually involve transcription of operation data from master sheets. Transcription errors are easy to make and hard to find when operation data are copied by clerks. Fatigue, eye-strain, inattention and plain clarelessness cause these errors.

Elimination of most transcription errors has been accomplished inexpensively at Barrett-Cravens by transcribing all necessary operation data for standard parts on 1¾ × 3½-in. Addressograph stencil plates which then are mounted individually in standard 2¼ × 4-in. frames.

As many as 16 operations have been listed on one of these stencils. Data shown include part number and name, sequence number of each operation, number of machine on which it is to be performed, operation name, standard hours allowed per 100 parts and the setup time allowed for each operation, if required.

Transcribing all this data onto Addressograph stencils would not have been possible were it necessary to spell out the name of each operation. Barrett-Cravens, therefore, has adopted a two-letter code for shop operations, as shown in the accompanying table. This code was adapted from the nomenclature code for shop operations developed by the U. S. Navy.

Stencilled Stock Orders

The stencilled operation data for a standard part are reproduced on the four copies of the stock production order. Addressograph stencils are made up for each standard part, whether or not the methods engineer has determined standard hour allowances for all operations. When blanks are shown in the transcribed stencilled data, order forms are routed to the methods engineer.

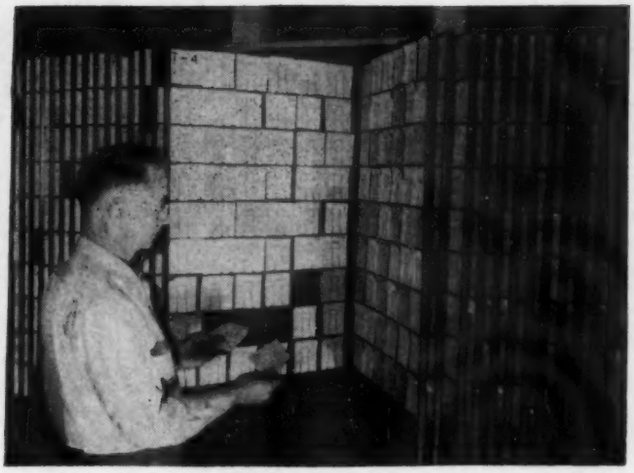
He records in the bottom half of the form the sequence of operations, temporary time allowances and other data, or marks the order to show which operations are to be performed as daywork, pending establishment of standard-hour allowances. This arrangement insures that operations not covered by standard-hour allowances are brought to the attention of the methods engineer.

As soon as Addressograph stencils are made up from data furnished by the methods engineer, they are used to prepare 3 × 5-in. reference file cards kept in the cost department for checking the accuracy of time slips. These slips are turned in at the end of each day or at the end of each operation, whichever occurs first, by production workers assigned to incentive operations. Addressograph stencils are then delivered to production control where they are filed by part number.

When a stock order is entered, the pink original copy is folded and filed according to part number on McCaskey control boards in the production-control office. The other three copies are clipped to a blueprint of the part and sent to engineering and the cost department for approval.

When approved, the production stock order and blueprint are returned to production control, and the yellow copy of the order is filed in the McCaskey board to replace the pink copy. The green copy then goes

Production orders for stock parts are made up on an Addressograph machine in the production-control office. Stencils for standard parts are filed in drawers under this work station



Two groups of control boards are in the production-control office. One set is for filing active orders for stock parts, the second for active sales production orders

Key man in the production-control office is the schedule clerk. He prepares machine-loading schedules daily from data kept in adjacent Kardex and McCaskey files and from delivery-date schedules prepared by the production manager

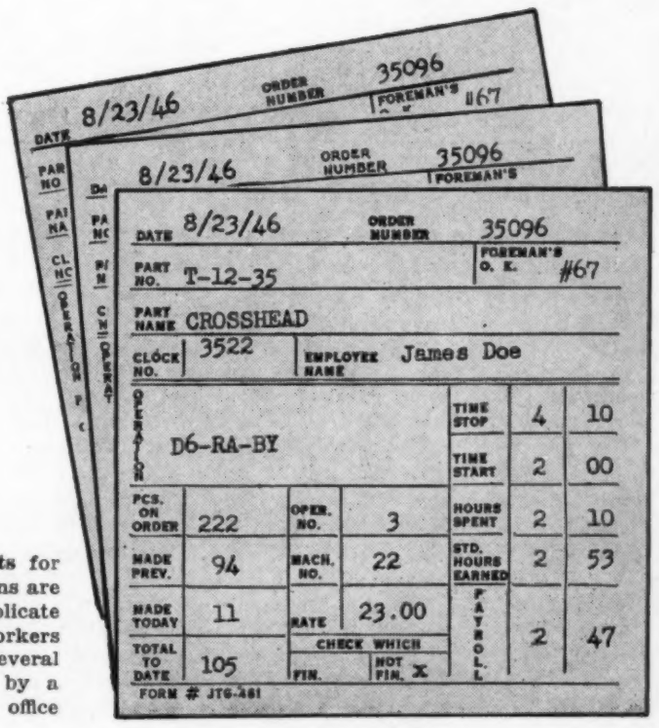
to a Kardex file which contains a separate envelope for each machine in the plant and serves as a machine-load schedule board.

Working from a list of parts required on specified dates and from a schedule of shipping dates for sales production orders, the schedule clerk in production control makes up daily work schedules for each machine in the plant.

Copies of these schedules are delivered to each foreman, who is responsible for seeing that work is done according to schedule, unless special arrangements are made with the production-control office.

When the schedule clerk has assigned an operation, the green copy of the stock order is transferred to the Kardex folder for the next machine or operation. As time tickets are returned to production control by the cost department's ticket pick-up clerk, completed operations are checked off on the schedule clerk's copies of the schedule sheets.

He thus has a complete running record of each job assigned to the shop. An initial *R* on the schedule sheet indicates that the operation is running, while an initial *F* shows



Green time tickets for incentive operations are made up in triplicate by production workers and picked up several times each day by a clerk from cost office

Code for Shop Operations

AA —Anneal
AS —Assemble
BA —Babbit
BC —Back-face
BD —Back-off
Balance:
BE—Static
BF—Dynamic
BG —Band
BH —Bead
BI —Bend
BK —Bevel
BM —Blank
BO —Bore
BP —Braze
BQ —Break
BS —Broach
BU —Buff
BW —Burn
BX —Burnish
BY —Burr
CA —Carburize
CB —Cast
CD —Center
CF —Chamfer
CG —Chase
CI —Chill
CJ —Chip
CL —Chuck
CM —Clean
CN —Coil
CP —Contour
CQ —Cool
CR —Cope
CS —Countersink
CT —Counterbore
CV —Crimp
CW —Crown
CX —Cup
CY —Curve
CZ —Cut Off
DA —Demagnetize
DC —Die-cast
DE —Draw
DG —Drill
EA —Edge
EC —Elbow Edge
EE —Engrave
EG —Etch
EI —Expand
EJ —Extrude
FA —Fabricate
FC —Face
FE —File
FG —Finish
FI —Fit
FK —Flange
FL —Flatten
FM —Fold
FO —Forge
FQ —Form (Press)
FS —Form (Turn)
Galvanize:
GA—Hot Dip
GB—Spray
GC—Electrolytic
GE —Gear Out
GG —Graduate
GI —Grind
GK —Groove
HA —Hammer
HC —Harden
HE —Head
HG —Heat
HT —Heat-treat
HK —Hob
HL —Hoist
HM —Hone
IA —Indent
Inspection:
IC—Inspection
IE—A.B.S.
IG—B.M.I.N.
IJ—Elec. Load Test
IL—Compress. Test
JA —Joggle
KA —Keyseat
KC —Knurl
LA —Lap
LC —Layout
LE —Lip
MA —Mark
MC —Mill
MD —Miter
NA —Neck
NC —Nibble
NE —Nick
NF —Nitriding
NG —Normalize
NI —Notch
NK —Nose
OA —Offset
OC —Oil
PA —Pack
PB —Paint
PC —Parkerize
PE —Pean
PF —Penetrate Blk.
PH —Pickle
PI —Pierce
PK —Plane
Plate:
PL—Copper
PM—Nickel
PN—Chromium
PO—Cadium
PP—Zinc
PQ—Tin
PR—Silver
PT —Plug
PU —Point
PV —Polish
PW —Press
PX —Profile
PZ —Punch
QA —Quench
RA —Ream
RC —Recess
RD —Radius
RE —Redraw
RG —Relieve
RI —Remove Center
RK —Rifle
RM —Rivet
RO —Roll
RQ —Route
RS —Sandblast
RT —Saw
SA —Scarf
SB —Scrape
SC —Seam
SD —Seat
SE —Serrate
SF —Set Up
SG —Shape
SH —Shave
SI —Shear
SJ —Shoulder
SK —Shotblast
SL —Shrink
SM —Slice
SN —Slit
SO —Slot
SP —Solder
SQ —Spin
SR —Spline
SS —Spot
ST —Spot Clean
SU —Spot Face
SV —Spot Turn
SW —Stamp
SX —Straighten
SY —Stress-relieve
SZ —Swage
TA —Tap
TC —Taper
TE —Tell-taling
TC —Temper
TI —Test
TK —Thread
TM —Top End
TO —Torch-cut
TQ —Trim
TS —Tumble
TU —Turn
TW —Turn, Rough
UA —Undercut
UC —Upset
VA —Vulcanize
WA —Wash
WC —Weld
WE —Arc-weld
WG —Butt-weld
WI —Lap-weld
WK —Seam-weld
WM—Spot-weld
WO —Wind
WQ —Wire
WR —Wire Brush

CODED STENCILS SIMPLIFY PRODUCTION CONTROL (continued)

that operation has been finished.

The fourth copy of the production stock order, printed on heavy manila paper, is stapled to the blueprint. It moves with the parts from operation to operation until the job is completed and approved by the final-inspection department.

On the reverse side of this copy, each operator records the quantity of parts finished on each date. Where discrepancies have occurred in payment for work done, operators who have failed to record their work on the back of these cards are assumed to be in error in making up their daily time tickets. This makes each operator keep a correct record on the back of this form.

Two different types of time tickets, a green form for incentive operations and a similar white form for all daywork operations, are submitted by production workers to report time taken for each operation. Operators are required to make up time tickets in triplicate when each job is completed.

A pick-up clerk from the cost department makes scheduled trips through each department so time tickets are gathered as soon as possible after each operation is finished. This prevents any operator holding all his time tickets until the end of the day and adjusting time on various incentive and daywork operations to his advantage.

In each case, all three copies of each time ticket go to the payroll office. The original copy is held by the payroll clerk, the second copy is returned to production control for filing back of the stock order form on the McCaskey control board and the third copy is returned to the operator at the end of each week. This gives each operator a permanent record of the work for which the payroll clerk has given him credit during the preceding week.

After an order is closed, the copy of the order on the McCaskey board and all No. 2 copies of time tickets for that order are stapled together and sent to the cost department with the manila copy of the stock order.

The closeout clerk in the production-control office checks to make sure that all time tickets have been turned in before sending a closed-out order to the cost department.

Checking Out-of-line Costs

If, after review by that department, the cost of a given lot of stock parts is found to be more than 10% above or below the cost of previously manufactured parts, all the papers for that order are sent to the methods engineer to determine why costs are out-of-line.

Frequently, it is found that costs are high because of factors not controllable by operator or foreman. Adjustments must be made in tools or methods to insure economic

OPERATION	QUANTITY FINISHED	DATE	EMPLOYEES CLOCK NO.
1	100	8/24	3062
2	60	8/25	2516
2	70	8/26	2991
3	125	8/30	3015

On the back of the manila copy of the stock production order is tabulated the number of parts completed by each production worker. This record makes it possible to check the time tickets for each operation

manufacture of these parts in the future.

If costs are satisfactory, the cost department records the cost of each part order on a standard record card and sends the yellow copy of the stock production order with its attached time tickets to the methods engineer for filing.

The methods engineer keeps in his file the last three sets of time tickets for each part, so time studies can be compared with the time taken on previous orders of a similar nature. In fact, the standard time-study form has recap columns on the reverse side for such comparison purposes.

Scheduling Special Parts

Sales production orders, requiring special parts or unusual operations, are scheduled through the production-control office on a second set of McCaskey control boards under a system which differs slightly from that used for stock orders.

Only three copies of the order are made up for sales production orders, the second or green copy being used in the Kardex machine loading files so the schedule clerk, when scheduling work for each machine, can have in front of him a record of all orders, whether stock orders or special sales production orders.

As a check against completion of work shown by operators' time tickets, a copy of the inspector's daily work sheet goes to the production-control office so the schedule clerk can review his schedule forms against the information shown on these work sheets.

NOTE: THESE JOBS ARE TO BE RUN IN THE SEQUENCE INDICATED

LATHE SCHEDULE DATE Jul.22,1946

LATHE NO.	JOB RUNNING	NEXT JOB	NEXT JOB	COMMENTS
NO. 1 ENG.	T-20-1056 Washer	T-20-2556 Washer	T-20-2026 Washer	No Operator
2	T-20-656 Core R	T-20-798 Core	T-20-178 Core	
4	ST-7-622 TUBE R	ST-7-816 TUBE		
6	T-28-91 CORE F✓	E-12-381 SPACER	E-9-40-A BEARING R	
17	T-2-34 X-HEAD F✓R	T-2-35 X-HEAD R		
22	T-2-35 X-HEAD R	T-2-27 X-HEAD	T-2-119 X-HEAD	
31	T-8-28 WHEEL R	T-8-193 WHEEL	T-8-199 WHEEL	
33	T-20-984 BEARING F✓	T-20-983 SLEEVE R	T-2-35 X-HEAD	
34	T-7-254 STUFF.BOX F✓R	T-7-333 STUFF.BOX F✓R	T-12-481 PISTON ROD R	
35	E-16-126 PIN R	T-20-1906 BUSHING	T-20-1904 BUSHING	
36				
37				
39				

Daily schedule sheets are made up for each foreman. It is his responsibility to see that operations are performed in line with the schedules, unless approval for changes is obtained from the schedule clerk in production control

A standard 3 × 3¾-in. card for recording data on completed stock-part orders provides easy reference to previous orders. These cards are filed on the same control boards on which are filed active production stock orders.

SEEN and HEARD

By John R. Godfrey

Ball Burnishing Headaches

I WAS INTERESTED in the ball-burnishing stunt shown in *American Machinist* recently because it took me back 20 or 25 years to the old Graham Paige plant in Detroit. They were using steel bolts to size and burnish valve guides. It was a quick method of getting the right diameter and secured a smoother hole than reaming. But it was soon abandoned because the holes were not straight.

Of course the material was a fine-grain cast iron and the hole was four to six diameters long. But there was enough difference in the density of the metal to allow the ball to go to one side in too many cases. So they went back to reaming. With the short bore of the gears and the presumably uniform density of the material, the plan evidently works satisfactorily. The material in the balls probably does not account for the difference in any way.

Cycles in the Shop

FASHIONS are supposed to go in cycles. Skirts fluctuate from ankle to knee length and back again. So is it, to a degree, with letters to the editor. One of my first recollections of the *American Machinist* was a letter by James F. Hobart, probably the first *A.M.* traveling editor, on grinding screwdriver points so the edge would bite into the screw slot instead of wedging itself out and causing various degrees of profanity. In a recent issue, this same trick is shown by Charles E. Krause. It is still a good thing to do and will be entirely new to many even if it was illustrated in about 1884—and was probably known well before that. Old tricks are always new to somebody.

Quarter-turn belts, in the same issue, also recalls one of the early shop problems in the days before electric motors on each machine eliminated problems of this kind. The trick of so locating the pulleys that the belt would lead onto the driving pulley at right angles to the shaft makes all the difference between success and failure. Otherwise they will not stay on the pulleys. Giving the belt a half-twist will help in equalizing the stretch on the edges. It also uses both sides of the belt. Mr. Ziemke probably never knew of the long and often acrimonius discussions as to whether the *hair* side of the *grain* side of the belt should run next to the pulley. Our pages in the late 80's and early 90's were full of this discussion.

Incentive Plan Includes Supervisors

Machine operators who exceed base rate receive 100% of the premium in plan based on "point system" used at Reed-Prentice Corporation

MUCH SUCCESS has been achieved in increasing productivity and general manufacturing efficiency, as well as in enlarging employees' incomes, by operation of a wage-incentive program at the Reed-Prentice Corporation, Worcester, Mass. The program is based primarily on the so-called "point system" and has been in operation several years.

One feature is the fact that machine operators who exceed the base point rate receive in added pay 100% of the premium. Another feature is the tie-in of the supervisory force with the premium plan. In addition to premiums earned, the company pays a guaranteed base rate, the average for the Worcester district.

The point plan is based on estimates from standard data, along with actual time and motion study by time-study men. In general, the application resembles that in numerous other plants both in and out of the metal-working industries. The "point," unit of work measurement, represents work done during one minute by an average man at a normal rate. The point value of each operation in manufacture of a part is derived by time study.

All time studies of all operations hence are reduced to a common factor of a point a minute, or a 60-point hour. A rate for each job then is established. This rate is normal output. A premium is paid for each point produced in excess of a 60-point hour. Points are evaluated by a premium rate per point arrived at by job evaluation.

This incentive plan for direct labor is supplemented by an arrangement whereby shop foremen participate. The unit of measure is a so-called "supervision point-hour." This point-hour is based on each and every point produced by the foreman's departmental direct help. When a foreman keeps up his operators' points, produces points himself, and keeps his departmental costs down, he aids his own premium. The foreman's premium possibilities are as great as, but no better than, the points produced by his direct operators.

Rejections, salvage and lost time are "costed out" against the foreman, whose point-hour is reduced ac-

DAY-RATE WORK FOR WHICH ONLY BASE RATE IS PAID

1. *Waiting for work*
2. *Waiting for tools to be sharpened*
3. *Waiting for machine to be repaired*
4. *Waiting for inspector or foreman*
5. *Waiting for crane*
6. *Sharpening and resetting of tools*
7. *Looking for tools, bolts, straps, jigs, etc.*
8. *Helping repairman repair own machine*
9. *Helping because of illness or injury*
10. *Special work because of illness or injury*
11. *Rearrangement*
12. *Cleaning*
13. *Hospital time*
14. *Repairing own work on salvage*
15. *Working in a day-work department because of lack of work in own department*
16. *Learning to run similar machine of similar type.*

JOBS PAID AVERAGE WITH SUPERINTENDENT'S AUTHORIZATION

1. *Setting and adjusting special tools*
2. *Hard castings, welds and sand*
3. *Machine in poor repair (proper speed and accuracy not available)*
4. *Making new tools for own job*
5. *Trouble with tools and fixtures*
6. *Learning new jobs (departmental transfer—entirely new type of machine or work)*

WORK PAID AVERAGE WITH FOREMAN'S APPROVAL

1. *Making new tools for the toolroom*
2. *Repairing work on salvage order caused by another operator*
3. *Instructing new operator*
4. *Experimental work*
5. *Repairing old jigs*
6. *Regular production not rated*

cordingly. Foremen are penalized for all operators not producing at a 60-point hour or better. No foreman can earn a premium until his operators have reached a degree of efficiency and productivity which puts them on a premium basis.

Once a rate is studied and published as permanent, no change is made unless the method of work, material, or tools are changed. As rates are set on a fair and reasonable basis, no trouble or controversy has arisen over this rule.

Operators' delays are paid for at the day rate, because no allowance is made in the rates for delays other than the personal rest factor. This procedure has held delays to a minimum.

Operators who are sent out of their own departments temporarily because of lack of work or breakdown of their machines receive their average point-hour based on the previous four week's performance for the points which they produce. The hours remaining, after prorating the time against the points produced, are charged against the cause of the transfer and are paid for on a day-rate basis against the operators' home department.

Average is paid for work classified as eligible for payment of average in the accompanying tables if a rate has not been set on it.

The point value is used by Reed-Prentice not only to measure performance of direct-labor employees and to pay them premiums, but also to establish standard costs and to set up load charts and other aids in scheduling production. The point-hour serves other purposes too: it is employed as a basis for upgrading or reassignment of jobs, and it gives a fair measure of the production of one operator as against another, and of one group of operators compared with another group.

The standard labor cost of a point in a department is determined by dividing the average base rate of the department by 60, because standard production per hour is 60 points. With the cost per point known, a standard labor cost for a part, unit or machine is arrived at by totaling the points of all the operations and multiplying by the cost of a point. The actual labor cost of a point is found by dividing the total labor payroll in a department by the points produced for it.

Over-all efficiency of a department is determined by comparing the standard cost per point with the actual cost per point. Standard point values for individual operations are tabulated to give production requirements for entire products, departments or individual machines within departments. Figures obtained from the operations sheets should be tempered by taking into account the point-hours of the department.

"I wasn't expecting quite so big a pay envelope this week."

The management prepares a weekly analysis sheet which breaks down all shop time into direct and indirect labor and further classifies the time into waiting, bad work, supervision and maintenance. This analysis furnishes the management and the foremen with an immediate and continuous analysis of shop conditions. It is an excellent barometer of departmental productivity for planning purposes.

One of the reasons why the point system is so successful at Reed-Prentice is that prompt and intelligent action by the management keeps it up-to-date. The system is not so rigid that it cannot be adjusted.

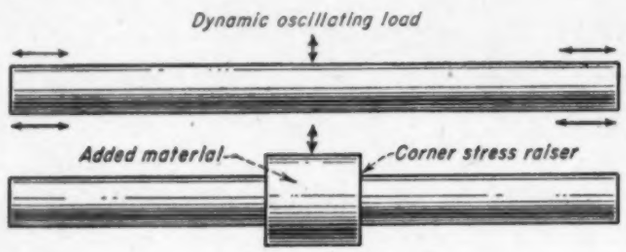
By means of its incentive plan, employees on direct labor jobs increase substantially their own earnings, those of their supervisors and those of the company. The increase in efficiency makes better use of available machines, and allows service departments to spread their facilities over a greater amount of direct labor.

TOASTER BRAKE

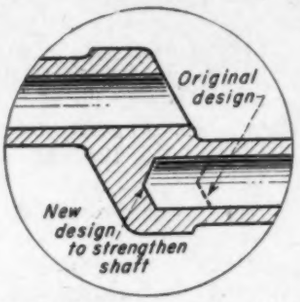
TOASTED BRAKE LININGS eliminate "brake-in" and give double the braking on first application, according to Alvin M. Yocum, engineer for Raybestos-Manhattan, Inc. The AAF demanded 75% initial efficiency from bomber-wheel brake linings instead of the usual 35%, to avoid 4 hr. of taxiing to wear linings in. To achieve this, linings were toasted with Calrod units to boil out volatiles for about half thickness and to char the surface, thus providing carbon that improved initial seating of brake shoes. They stop a 140,000-lb. airplane in 12 sec. from 100 mph. Truck and bus operators are now considering the idea; anticipating reduction of drum fouling, jerky applications and noisy brakes after "boiling" to an emergency stop.

H. H. Kerr, engineer for U. S. Rubber, says more than twice engine horsepower is required to stop a car from 70 mph. or a plane from 100 mph.

In an airplane brake drum heat is generated so rapidly, it does not have time to pass through the drum wall, so martensite is formed there. A 4,190-lb. automobile with 4-wheel brakes develops 685,000 ft. lb. of kinetic energy in stopping from 70 mph. Drums must absorb 2,470 ft. lb. per swept sq. in. of drum and 13,700 per lb. On a 41-pass. Greyhound bus weighing 27,150 lb. and having six brakes, 4,430,000 ft. lb. must be absorbed, giving a kinetic energy of 3,450 ft. lb. per swept sq. in. or 6,950 per lb. of drum. On a B-29 bomber weighing 140,000 lb., 16 brakes (20x2¾ in.) have 2,760 sq. in. of swept area to absorb 57,000,000 lb. from 110 mph. This forces drums to absorb 20,600 ft. lb. per sq. in. of swept area, or 117,000 ft. lb. per lb.



BEEFING UP this shaft under a dynamic oscillating load was not the right answer. Result of 50% increase in diameter at center with no fillets—50% reduction in fatigue strength



REMOVING METAL may be the answer. Drilling out the crankpins reduced stresses by changing their effective positions

Is 'BEEFING UP' the Wrong Answer?

Stress engineer offers some sound ideas on design and what the shop contributes, based on Continental Motors' experience

WHEN a part or machine does not break, it is usually too heavy. If it does break, it is too light. But "beefing up" the structure may actually weaken it, instead of strengthening it.

These are the opinions that Wm. T. Bean, Jr., stress engineer, Continental Motors Corp., expressed at the Detroit meeting of the Institute of Aeronautical Sciences. He abhors the conventional testing of machines and devices to destruction. Frequently after the failure it is impossible to determine just what happened first, so it is like trying to find the quality of a crate of eggs by first breaking them.

He uses "stress coat," the brittle lacquer developed by Magnaflux for stress analysis, and electric strain gages in operational tests below destructive levels.

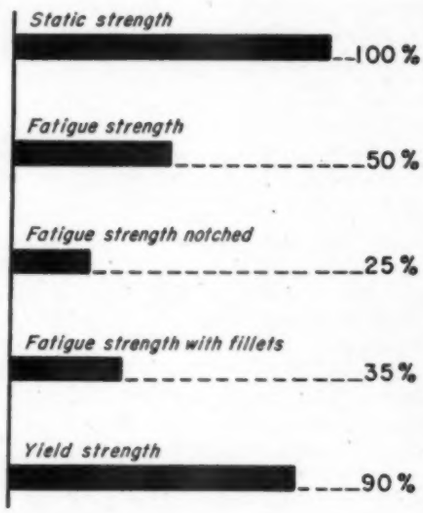
How conclusive these tests are is indicated by one in which crankshaft failures in an engine could not be traced to material, workmanship or design. Finally, in flight testing with strain gages, it was found that the position of the propeller relative to the crankshaft was the cause.

Maximum stresses ran to 80,000 psi. with the steel propeller in one position, but advanced to 280,000 psi. when a position at right angles to the first was reached. Using a wooden propeller introduced a stress of only 50,000 psi., demonstrating clearly how some outside factor can wreck the reputation of a properly designed machine.

To emphasize his experience that beefing up does not cure failure ills, he cited an example of a simple shaft, the center of which was increased 50% in diameter with a reduction in fatigue strength of 50%.

Often the strength of a piece can be increased by removing instead of adding metal. The stresses in a crankshaft were reduced by drilling out the crankpins farther than the original design required. The most powerful engine Continental builds has hollow crankpins and main bearings, but stresses are carefully analyzed. Where the average automotive crankshaft carries 1 hp. per lb., aviation crankshafts carry 20 hp., yet stresses are lower in the aircraft shafts.

In another case, metal was removed without weakening the assembly. It was discovered in accurate stress analysis of some parts on a gasoline engine that some bolts were not stressed at all. They were doing nothing. If they were tightened up too tight, they actually strained the parts. Bolts, bosses and machining were eliminated, and the saving in a year was more than the entire cost of the stress analysis and new design.



ADDED METAL may reduce fatigue strength if it is added without careful analysis of stresses and possible stress raisers in the design

What the Shop Contributes

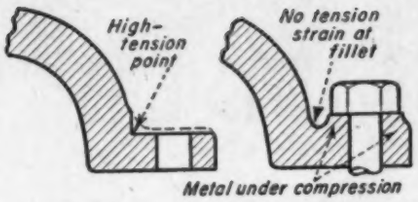
The designer determines the shape and probable service loads, but the shop too contributes to the success of any product. In the automotive industry where production quantities are large and costs must be kept down, the production men in the shop have more to do with the design of the parts than many of the engineers.

The parts have to be designed first for production and second for function. He emphasized this by saying, "Given an average design and good material but poor processing, the parts may have only 10% of their potential strength and life.

This can be increased to 50% if the best processing practice is followed. Then if the designer gets busy, he can improve it anywhere up to 100%."

An example of this was a crankshaft being rough-machined, case-hardened and then ground to correct for distortion. Under Magnafluxing, grinding cracks indicated that the beneficial compressive stresses from case-hardening had been relieved and the part weakened.

The most serious trouble was due not to breaking through the case but to weakening it so it failed in service. Strength of such shafts ranged about 20,000 psi. Then nitriding was adopted. The shafts could be completely finished before treating. Thus there was no subsequent shop work done to disturb the beneficial compressive effect of the surface treatment, and strength increased to from 100,000 to 120,000 psi. The shop not only made a better shaft, but eliminated a bottleneck.



ADDING METAL at the right spot will increase strength. Raising bosses helps prevent failure as spot facing with a counterbore introduces a point high in tension at the corner. Raised-boss design puts metal under compression

Here is what actually happened. In order to get the necessary finish of 30 microinches, heat-treated parts were ground and all surfaces and the insides of all holes were polished and held to close limits. When the shop finally started nitriding the shafts, they were not limited to such close dimensions on holes and other surfaces so they could rough off the metal in the fastest way they knew.

All polishing was eliminated and the finished shaft, after nitriding, was untouched. This shaft was at least five times as strong and much superior from a service standpoint. Nitriding took no more than 2 man-hours, effecting a saving of 8 man-hours in polishing time. Previously it took longer to polish the shafts than to machine them.

The nitrided coating had a tensile strength of approximately 400,000 psi. and enveloped the steel part like a tight glove, putting the subsurface material under compression. As most breaks are caused by tension, the core of the piece had to overcome this residual compression before it could be stressed in tension.

Nitriding eliminated polishing because nitrided tool marks no longer were stress raisers. It penetrated the surface, equalized internal stresses and did not distort the piece as case-hardenng did. It furnished, besides these desirable characteristics so necessary to the dynamic strength of the parts, a superior wearing surface.

Home-made Lathes for Liberty and Pray Brothers, Pray

BACK in World War I, Lucien Yeomans made shell lathes with ground steel shafting tying the cast head and tailstocks together and forming the ways for the carriage. He also built a large planer with a concrete bed which was used for special work. Out in San Jose, Calif., the Pray Brothers took on a lot of large war work for World War II, shafting for Liberty ships and the like, and built their own lathes to handle them.—By Frank C. Hudson

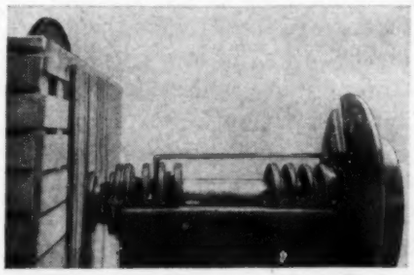
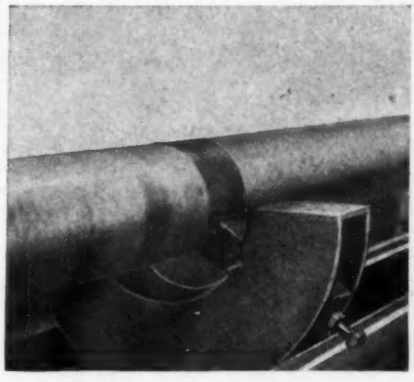


Fig. 1—The headstock is made of steel plates welded into proper shape and has bearing caps that are curved plates stiffened with four steel half-collars, welded in place. These cover the babbitt bearings in which the spindle runs. At left, inside the guard which looks like a crate, is the driving mechanism, consisting of automobile transmissions and a Reeves variable-speed drive. Just showing over the top of the guard is a sprocket and chain which drives the spindle

Fig. 2—The steadyrest, built from plate steel welded to form a hollow support for the shaft. Supporting shoes are held between the two sides and adjusted by the screws shown. This view gives some idea of the size of the work handled



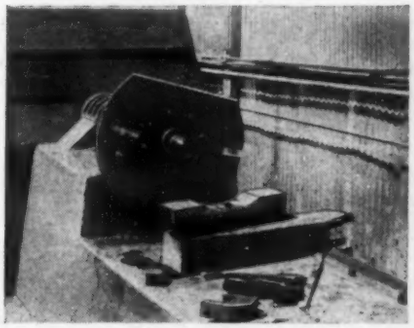


Fig. 3—A lathe with a concrete bed which was used simply for polishing shafts. This has the same kind of bearings as the other and the plate-steel faceplate is riveted to a threaded backing plate that screws onto the lathe spindle. This lathe was in a small building away from the main shop. To handle heavy shafts, the Prays built a gantry crane driven by a small gasoline engine. This finishing building was not large enough for the crane to go in, so they did one of the most unusual things I've ever seen. They made the roof of the building removable in sections! When it was necessary to handle shafts into this lathe, they took the roof off and ran the gantry over the wall on one side. Publicized California weather was helpful in this particular case

ROUND TABLE

Should the Boss Get Tough?

"Say, Al, did you notice how everybody started grabbing something to do when the Big Boss came blasting down through the plant this afternoon? Boy, was he sore—you could hear him a mile!"

"You know, Ed, I've been thinking about that; I never paid too much attention when the Boss blew up. I just took it for granted that it had to happen every so often and let it slide off, like water off a duck's back. But this afternoon, while the tirade was going on and after it was over, I noticed things that were not good."

"Well, I don't know whether it was good or not, but I can tell you one thing: Everybody was on his toes for a little while. They really plugged away. What made today any different from other days?"

"I don't think it was any different, Ed. It just happened that this time I wasn't getting beefed at, so I was in a good position to watch the reactions. If blowing the lid off always affects the department like it did today, the Boss should control his temper."

"Now wait a minute, Al. You know as well as I do that the Boss has to lay the law down every so often to keep people on their toes!"

"Oh, that's just an old-fashioned notion. Let me tell you what I saw this afternoon, Ed; then you tell me if it was good. As you pointed out, everybody grabbed a tool or tried to look busy doing something, but actually I think production fell 50%. Lots of the boys acted like kids at a show—those that were working stopped to enjoy seeing someone else raked over the coals, and even those that kept on working didn't have their minds on their work!"

"Well, Al, that is kinda like taking medicine—it doesn't do you much good when you're taking it, but afterward. What if it did slow up things for a few minutes? You have to admit the boys stuck to their jobs for the rest of the day."

"Mebbe so, but I don't think they did much work. They spent the afternoon finding out what the ruckus was about, then thinking it over and discussing it among themselves. You know, I get hot and blow my top once in awhile, too. But I was thinking today, after that exhibition, that it really doesn't impress the men as much as I thought—or at least in the way that I want it to."

"Listen, Al, you *have* to jack your men up once in awhile or they get in a rut!"

"I don't think so. I noticed that, besides the group reaction, there were a lot of different individual reactions. Some of the fellows were laughing up their sleeves—thought it was funny. Some others were sore because they had been bawled out in public. I'll bet others were saying plenty to themselves about a Boss who can't hold his temper. For some reason, Donald Duck came to mind. You know how he stamps around shouting stuff nobody can understand. Well, the Boss was doing the same thing."

"Well, Al, I'll agree with you on one thing—that's a good name for the boss—Donald Duck!"

***DOES THE** Big Boss have to "throw his weight around" every so often just to keep people in line? If he doesn't, is he considered an "easy mark"? What have your experiences been? Is the technique of management changing? Discussions of earlier topics appear on later pages.*

Practical Ideas

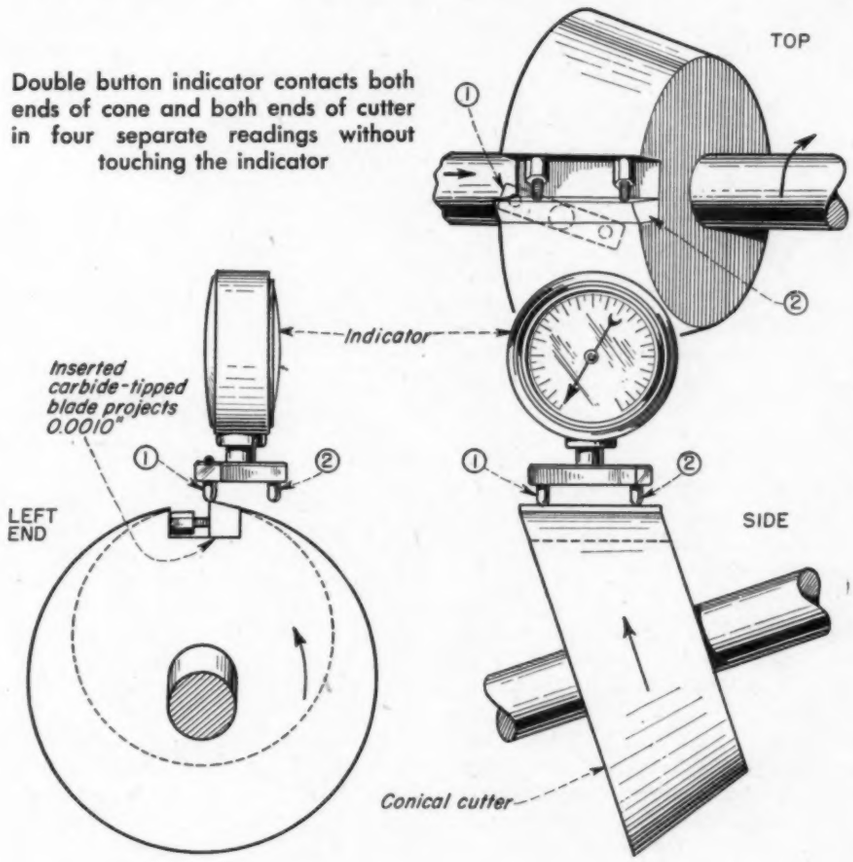
Single Indicator Setting Tests Inserted Cone Cutters

ERNEST ANDERSON
Muskegon, Michigan

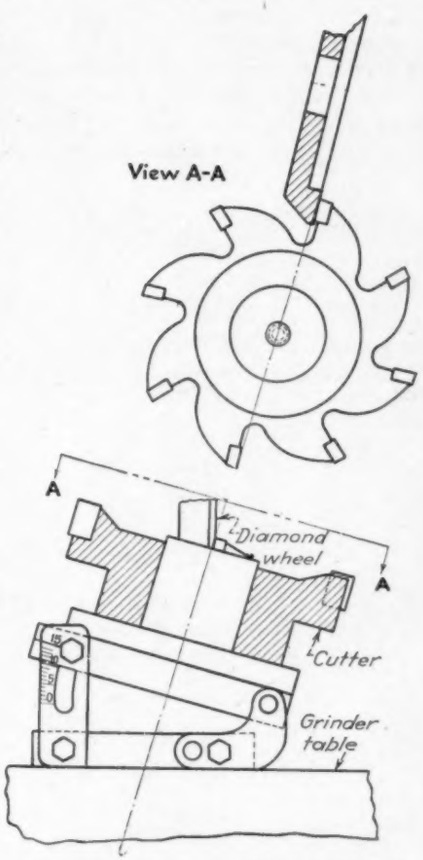
Adjusting the inserted-carbide-tipped cutters in some conical mills ranging from 2½ to 8 in. maximum diameter proved to be a tedious job when the indicators had to be continually shifted and readjusted.

This problem was speeded up tremendously by the simple expedient of mounting a double-point on the indicator plunger. This base was squared with the conical surface but offset about 8° from the longitudinal axis.

The measuring procedure now works like this: From the illustration, button No. 1 on the large diameter will provide the first reading of the cutter body. Rotating the cutter in the direction of the arrow to the position shown will give the reading at the blade cutting edge. No. 2 hasn't touched yet. Rotating a little further will cause No. 1 to drop into the cavity and the beam will straddle the cutter and No. 2 will then contact on the small diameter of the cutter body. This reading should be the same as the first reading. A few more degrees rotation and No. 2 will rest on the cutter. This reading should equal the second, and the difference between the first and second and between third and fourth should be the same.



Double button indicator contacts both ends of cone and both ends of cutter in four separate readings without touching the indicator



Tilting table holds carbide-tipped milling cutters for regrinding

Angle Table Speeds Cutter Rake Angle Grinding

CHARLES HOLDERITH
Summit, New Jersey

Re-brazing of new carbide tips for face and shell mills has been halved by redressing on this fixture as soon as wear or small breaks occur.

The table permits rake angle set-

tings up to 15° and this could be increased if necessary; studs of various sizes can be mounted on the table to suit the cutter bores and permit indexing to each tooth on an accurate center.

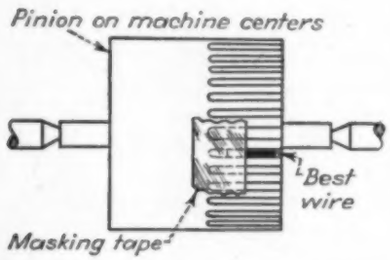
Diamond cup wheels are used and the back face is ground away to insure plenty of clearance between wheel and cutter body.

Small Thread and Gear Measuring Pin Technique

L. R. FITZSIMMONS
Portland, Oregon

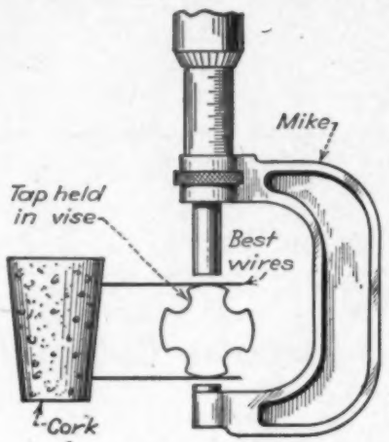
The 0.0546-in. diameter pins we use for checking our 32 D. P. gears have an unusual propensity for getting on the floor and in the chip pans so for some time I've been keeping them stuck in the cork of a small 1-dram

Tiny Best wires are protected and kept available in a small bottle



Gear measurements are simplified when the pins are held with tape

bottle, but that only kept them from getting lost in my tool box. After dropping one of the measuring pins about 3 times through the bed channels of our gear hobber into the chips, I had endured enough of my awkwardness and got some drafting or masking tape and with a little



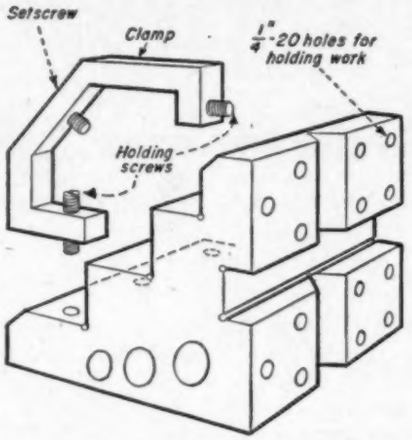
Tap and screw thread measuring is done with pins stuck in a cork

patch about the size of a postage stamp, stuck one pin in a convenient position with one end exposed far enough to mike over. After that it was fairly simple to stick the other pin opposite with another small piece of tape and have both hands free to mike with. I found, too, that the pins can be left rather loose under the tape to float into a true bearing in the gear tooth, also to pull out and check the tool on each side of the one you "thought" was the opposite tooth. Even then they don't fall out easily. The spare supply of tape can be wound around the bottle for safe keeping.

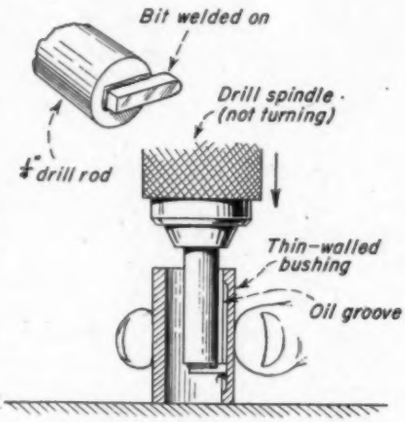
Speaking of measuring with wires also reminds me how much easier it is to measure threads of fine thread taps (most of ours are 48 thd.) over wires if one remembers (in the absence of a regular 3-wire fixture) to stick about ⅛ to 3/16-in. of the end of the wires in the cork of the bottle you keep them in, for small taps, or in a piece of soft wood or eraser, for larger sizes, in their approximate position and with the shank of the tap held in a vise or in the machine, hold the cork with the wires with one hand and mike with the other.

Soldering Cast Iron—File surface clean, polish with #80 or #100 emery cloth and buff. Muriatic acid or strong zinc chloride will now etch the iron so half and half will flow as though the metal were copper. (Be sure and wash off thoroughly after soldering or surface will rust. *Martin Peterson, Barrington, R. I.*

Layout Cube—I call it the "Toolmaker's Friend." It has three 90° steps along one diagonal face, a vertical 90° along the back face with a horizontal square slot intersecting



this at right angles. Fourteen ¼-20 tapped holes in the back face facilitate clamping vertically while a strap which bridges the center diagonal 90°-step serves to clamp work on this face. The square slot may be used to position certain work, or merely to act as clearance for flanged heads when they are clamped in the vertical Vee. *D. L. Leslie, Birmingham, Mich.*



Oil Groove Scraper—Most small bushings are fragile enough to preclude vise clamping. To gouge the oil grooves in small bushings we make, I have a special tool, consisting of a piece of drillrod with a small toolbit welded across the end and ground like a chisel. This, chucked in the drillpress gives a vertical cutting stroke, the length of which is controlled with the stops. Work can be held lightly between thumb and finger on the drill table. *Ernest Hill, New Castle, Pa.*

High-Speed Assembling Fixture Cuts Noise and Lost Motion

JOSEPH F. BUDNICK
Jamaica, L. I., N. Y.

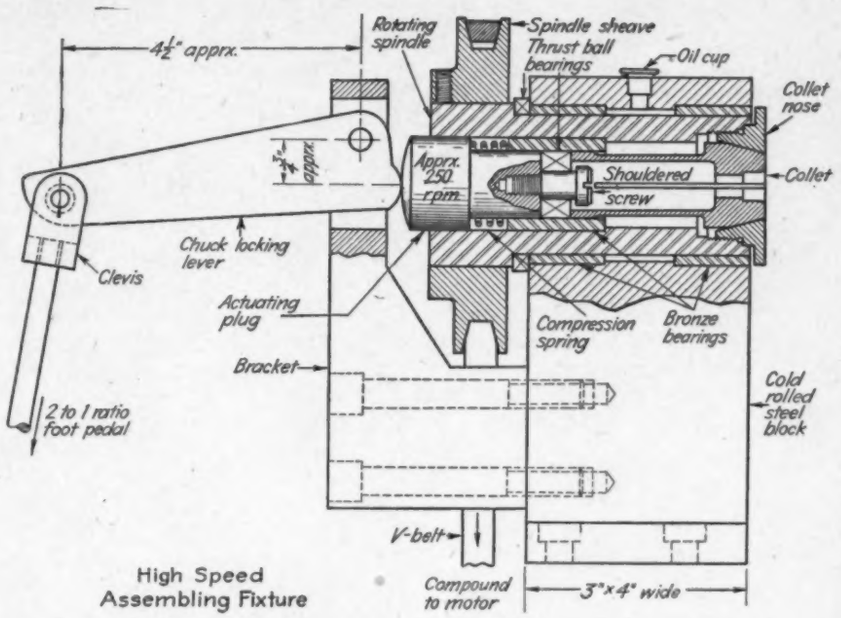
Modern high-production methods require the fullest application of electric hand drills and mechanical screwdrivers in assembly operations.

However, at least two important disadvantages seriously affect the efficiency of these operations. As the gears in the mechanized driving unit rotate, the housing acts as a bell, amplifying the whine to a shrill, fatigue-inducing din; secondly, since it is not practical to put down and pick up the tool each time the operation is performed, the unit is commonly suspended on a spring-tensioned line above the head of the operator. For assembly operations where the total time of picking up and putting down of the driving unit represents 5% or more of the actual assembling time, this motion and the resulting time loss at the end of the day can add up.

Both of these difficulties are eliminated easily by the use of a simply-constructed high-speed collet-type fixture. The principle used is similar to that incorporated in a standard screw machine, as the driving collet is engaged or released while continually rotating, in this case, by the pressure of the operator's foot.

A standard "push" type collet is used to permit interchangeability with any other size collet within the range chosen. A hardened and ground collet nose is screwed into a hardened and ground hollow spindle, which rotates in bronze bearings located in a block of cold rolled steel. A centrally bored hole in the hollow spindle has another bronze bearing which is driven in with a light press fit. The collet end is located in one end of this bearing with about 0.010-in. clearance.

A shouldered actuating plug, when acted upon by the lever, transmits the lateral thrust through ball thrust bearings against the heel of the collet. The thrust bearing is retained by a shouldered screw. A compression spring forces the shouldered plug back when lever pressure is removed. The hollow spindle is continually rotated by a sheave which is mounted on the spindle. A ball thrust bearing absorbs the thrust between the shoulder on the hollow spindle and the body of the fixture.



Pedal-actuated collet-chucking machine drives standard screws quietly

Three-Legged Plug Gage Has Wide Adjustability

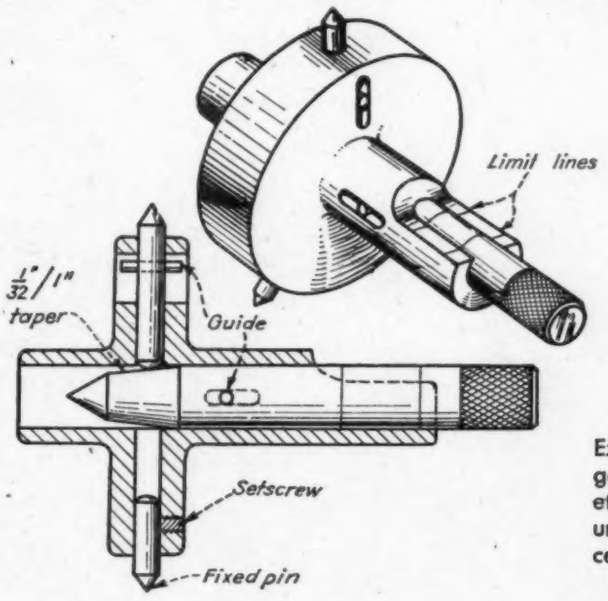
CECIL H. SMITH
Galt, Ontario

This gage provides an easy way to measure internal threads, undercuts, and unusual holes on a semi-production basis, because it can be inserted into the work with the gaging pin retracted, and the reading obtained by pushing in the taper pin thereby extending the gaging leg.

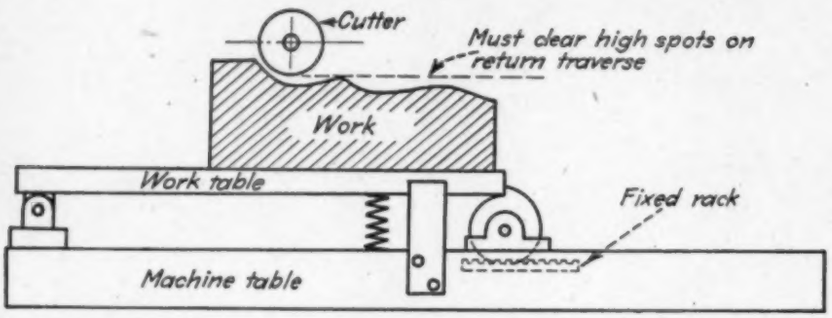
There are several ways to make the gage, especially when wide adjustment is desired. Essentially, two of the legs are semi-fixed, and the third does all the moving. The moving leg bears against a taper on another pin which slides within the axial handle of the tool, and is retained and guided by a pin and slot.

With a taper of 1/32nd in. per in. (on one surface) the limit lines can easily show discrepancies of half a thousandth. The pin and milled flat portion of the body can be graduated in several ways, too. For an all-purpose gage it could be graduated in thousandths directly (using a taper of 0.020 in. per in.) and a vernier provided, on the gage body if desired.

Different taper pins and legs of different lengths can adapt the gage to a wide range of internal diameters.



Expanding leg internal gage provides micrometer accuracy for measuring internal steps recesses and undercut cavities



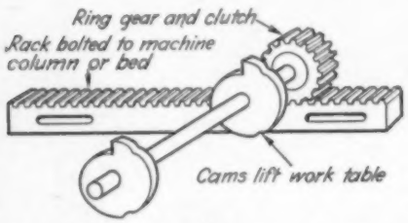
As the machine table advances on its cutting stroke, the cam rolls along on the fixed rack, moving the work up and down according to its profile

Contour Milling Device Uses Cam and One-Way Clutch

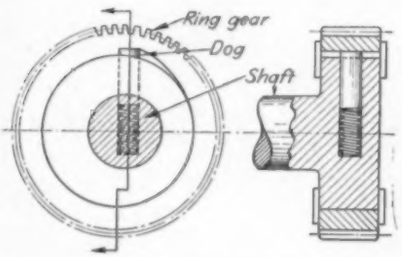
E. J. HILLS
Rock Island, Quebec

Here is a mechanism for rise and fall milling especially applicable to blind cuts which offers automatic cutter clearance on the return stroke.

Instead of a template, the form is controlled by a cam which is rotated positively in one direction only by a



Circumference of pinion must be greater than stroke so cam makes one turn



Idle reverse stroke is permitted by the spring-pin driving dog which retracts

pinion or ring gear having a one-way clutch. The gear, whose circumference equals or slightly exceeds the length of the piece, is driven by a rack mounted on some fixed part of the machine while the camshaft and gear are mounted on the reciprocating table. The work table is pivoted at one end and rests on the cam, using a small follower, if necessary, at the other end so the design of the cam must take the curvature of the table lift motion into consideration. At the end of the cutting stroke, the cam has a deep enough drop to allow the table to fall so the cutter will clear the highest point on the profile during the return stroke. (The cam remains stationary while the ring gear is rolling back along the rack.)

The clutch amounts to a one-tooth internal ratchet with a spring-loaded pin instead of a pawl.

The device has the following features:

1. No straddling of machine table
2. No template required
3. Clears work on return stroke
4. Compactness
5. As the cam is uni-directional, very sudden drops are possible.

Keyed Broach Maintains Accurate Alignment

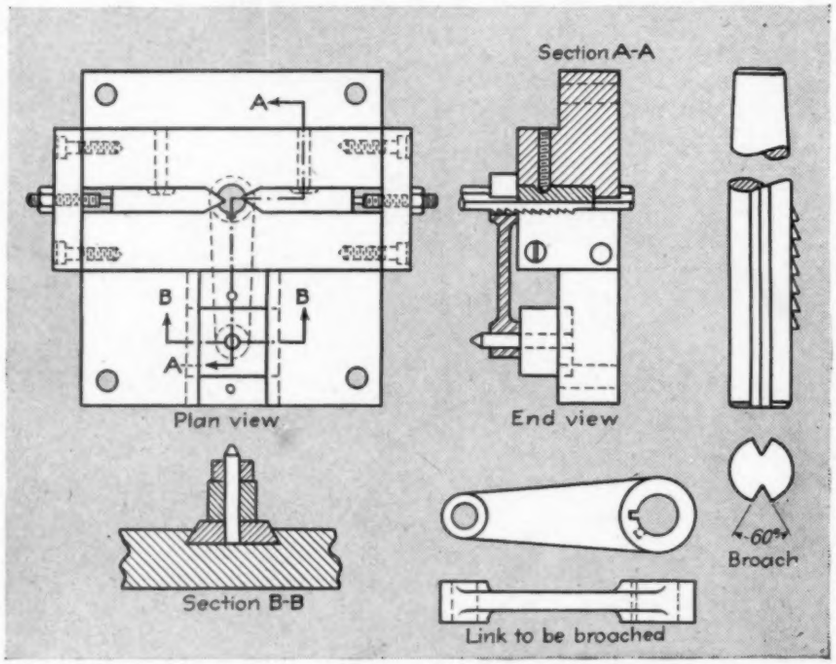
WILLIAM H. GENICH
Racine, Wisconsin

Slots or keyways often have to be in a certain angular position within close limits. We had to make a lot of links of various lengths where the driving keyway had to be right on the center axis of the piece, and all the auxiliary broach guides we tried failed to keep the broach from twisting until we built this fixture.

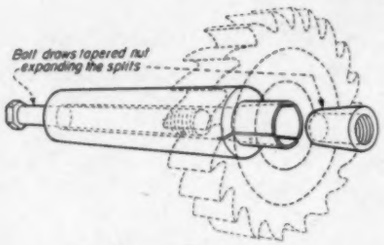
Now, broaches are shop-ground or purchased with two 60° V-grooves already ground so they will fit the guide and slip between the two pointed pins which hold the alignment without any chance for error. Each pointed pin is aligned by a setscrew through one side.

Links, in turn, are mounted on the fixture and located, according to length, by a sliding dovetail block carrying suitable build-up spacers and a pin to fit the small end of the link. Each link remains horizontal, and the build-up block can be changed to suit varying boss widths, and once the broach enters the piece, there is no chance for twisting.

Other keyway angles are produced by grinding the broach slots at a different angle and other hole diameters are possible using bushings.

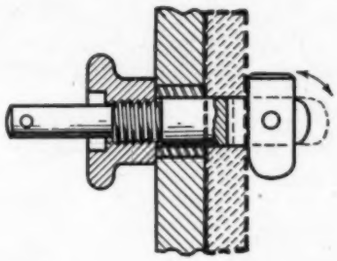


Slotted broach fits guide pins in key-slotting fixture and provides rigid alignment for long broaches

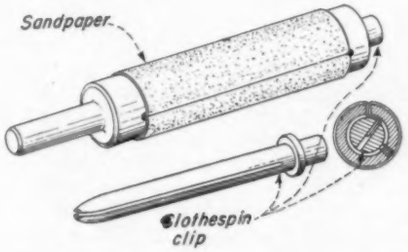


Expanding Mandrel—This specially designed adapter is used for cutting side clearance on plain milling cutters. The adapter fits into the tailstock, spindle and the cutter fits over the split end. The draw rod then pulls the tapered nut which, in turn, expands the splits, holding the cutter securely.

The adapter is also useful for holding jobs which require side or face machining. *Joseph J. Urello, Bethlehem, Pa.*



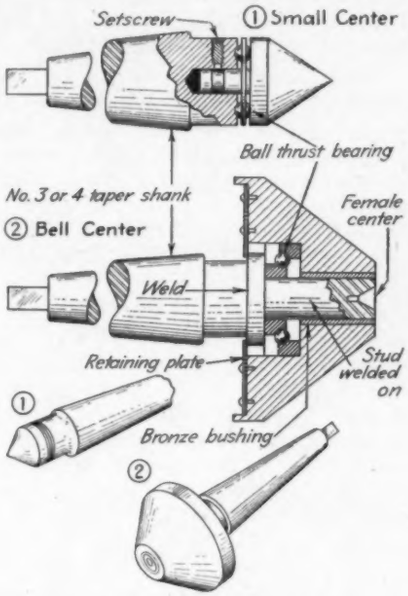
Clamp—Drill templets are easy to fasten to work with this little push-through clamp. When accurate register is required in the clamp, use drill rod and bush the templet hole. The clamp is merely inserted, and the T swung into position and the screw drawn up. *Frank J. Peragine, Brooklyn, N. Y.*



Drum Sander—A tubular, slotted body and a clothes pin-like clip will make a very effective small sanding mandrel. The paper is cut long enough to reach around the body so both ends extend to the opposite side of the hole. The clip is inserted and given a turn, tightening the paper. Friction, depending on paper thickness and clearances will hold the paper securely. *Charles Kidwell, Wichita, Kans.*

Two Centers—A small live center and a large bell center were made in a short time by taking advantage of some discarded taper-shank drills. The small center requires only the construction of a 60°-point with a pilot to fit into the shank. A small three-piece thrust bearing can be fitted between the point and the shank and a setscrew prevents the point from falling out.

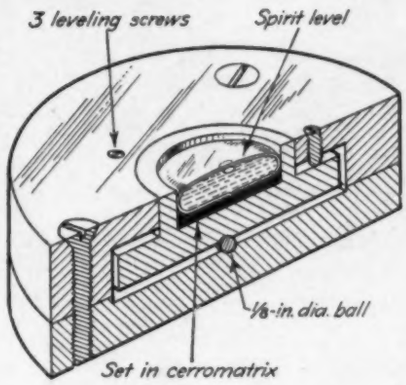
The bell center requires more work, but it's worth it. An extension is welded to the shank and machined to act as a seat for the radial-thrust ball bearing, and to pilot and guide the large center. The center turns on the extension with a bronze bushing to take any slight twisting stress, but the ball bearing will take most of the load. A cap fitting over the rear of the center serves the double purpose of holding the center in place and acting as a grease retainer. *George Caple, Stevensville, Mich.*



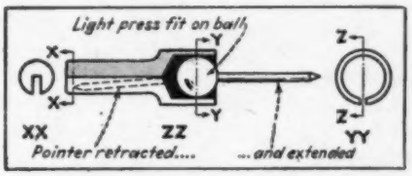
Center section—wiggler extended

Wiggler reversed for storage

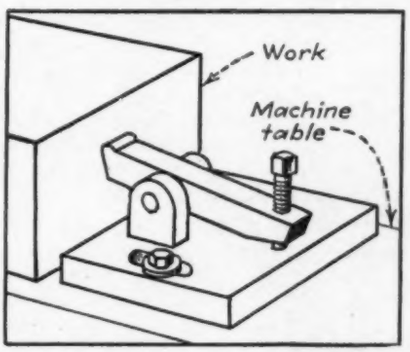
Wiggler—A tubular body with a screw cap permits the wiggler to be reversed and inserted point first for protection of both point and personnel, and for compact storage. *A. M. Schweda, Chicago.*



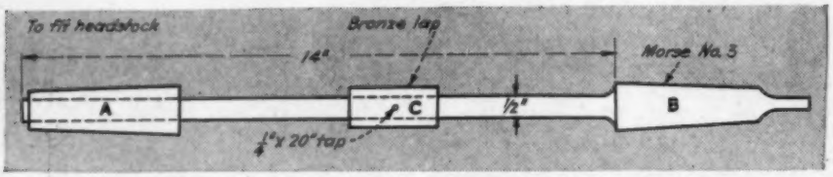
Level—A 360° pocket level can be made by cementing a spirit level into a metal base, machined as shown. The base fits a case which supports the level over a ⅛-in. dia. steel ball so adjustments can be made with 3 leveling screws in the top of the case. *Charles Kidwell, Wichita, Kansas.*



Wiggler—Turn and bore a small piece about as shown to fit a small ball, then mill a slot full length. The ball and pointer should be a light press fit and the slot will provide a spring grip. The pointer can be reversed into the slot for safe storage. *Peter Riggio, New York, N. Y.*



Clamp—To hold work for planer or shaper so the top surface is unobstructed, I use serrated lever clamps, firmly bolted to the machine table as close to each end of the work as possible. Tightening the two (or more) clamps simultaneously squeezes the work but with a considerable downward push. *Hugo Carlson, Red Wing, Minnesota.*



Long mandrel with taper shank, B, is guided in the rotating headstock by sleeve, A. Lap, C, is fed back and forth with tailstock handwheel as chuck turns around it

Centered Bronze Lap Trues Universal Chucks

C. M. KING
Oakland, California

Three-jaw universal lathe chucks get out of true very easily and for a variety of reasons. Wear occurs more toward the outer end of the jaws because of the amount of short jobs that are gripped near the front, but then a long piece can no longer be gripped full length.

We adopted the following procedure to maintain our 3-jaw chucks in good condition. A ½-in. dia. mandrel was made, 14 in. long with a No. 3 taper shank to fit the tailstock. A taper sleeve for the headstock was made and carefully bored and reamed in place to fit the mandrel closely but allowing it to slide and turn freely. A bronze lap about 1 in. in diameter is fitted to the mandrel and setscrewed in place.

After the chuck has been cleaned, reassembled and mounted, the mandrel is fitted in the tailstock and slipped into the headstock sleeve. The jaws are brought down lightly so they just touch the lap. The lathe is run at about 250 rpm. with the sleeve A, well oiled. Abrasive is used sparingly and care must be taken to prevent it from working off the lap and into the sliding bearing. The tailstock is fed back and forth to lap the full length of the jaws, and the machine is stopped occasionally to check the work and tighten down on the jaws a little. Care must be taken not to try to cut too much for the jaws may freeze in the bronze and damage the mandrel.

Jam Nuts Make Free-Swiveling Compound Do Ball Turning

PETER CERVELLI
Hicksville, L. I., N. Y.

None of the lathes in our shop was sturdy enough to support a 2-in. radius form tool for the ball ends on some shafts I had to turn. But the job was done successfully using a single-point tool and the compound alone.

The nuts were loosened slightly and jam nuts added. The adjustment was made so the compound would turn stiffly and with no backlash. The compound was reversed 180° from its normal position and the cross slide adjusted until the pivot point of the compound was on the spindle center line. This brought the tool post slot to the front side of the lathe, so the tool was inserted in the regular way, and adjusted so the point traced a 4-in. diameter circle on the horizontal center line.

A husky lever bolted in the compound tool post slot overcame the stiffness.

Once the adjustments have been completed, the carriage should be locked so it cannot be accidentally knocked off center.

NOW...$25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

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Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Twenty-fifth Selection—Walter J. Hoeckele's Two Spring Winders

NEWS OF METALWORKING

WAA Reveals Breakdown for Disposal Of 500,000 Surplus Machine Tools

WASHINGTON — War Assets Administration outlines for AMERICAN MACHINIST its estimated breakdown of disposal through channels, of about 500,000 machine tools in stock and still to be received through surplus declarations as follows:

1. 80,000 already being certified to Strategic Reserve by authorization of OWMR Director, John Steelman.
2. 30,000 additional for reserve, now being screened by Army Air Forces; probably would be added to the Strategic Reserve.
3. 100,000 to schools, under nominal 5% of value offer.
4. 100,000 to foreign purchasers.
5. 190,000 balance to be divided among domestic purchasers under the Clayton and fixed-price register programs, plus some for a still larger military reserve now under discussion, plus those to be salvaged and scrapped.

World Tension a Stimulant

Army and Navy support for the industrial reserve is stimulated by present international tension. A large machine tool standby would save vital time in preparation for any early emergency. Some general-purpose machines would be suitable for many years to come. WAA officials are suggesting storage and maintenance of the tools in surplus plants which are unsuited to other purposes. Armed forces are advised by WAA experts in screening for the reserve and do not often reject WAA suggestions. War Assets and Army-Navy Munitions Board are proposing legislation which will determine how the government will pay itself for the surplus tools, and authorize transfer of title.

Disposal to Schools Spurred

WAA believes that disposal to educational establishments can be greatly expanded. Allowing about $3,500 each (cost) this training sale program would add up to $350 million. Many schools, it was found, cannot afford the 5%-of-cost nominal charge, and WAA is considering a charge of only $1 apiece for training tools. WAA offers several reasons for its training offer: (1) removes the tools from surplus; (2) aids the schools, whose facilities were depleted by war; (3) builds a backlog of machinist skill for security, and (4) a backlog of machines which could be requisitioned.

Surplus Exports Promoted

WAA in its export advertising is urging (1) that foreign purchasers or their agents inspect their purchases carefully, and (2) that manufacturers buy surplus machines for reconditioning and export, or that they accept tools from foreign purchasers for reconditioning for a fee. Some dealers are equipped to recondition tools. A machine costing $7,500 new, for example, may sell from surplus at $1,600. This allows a margin of more than $5,000 for handling and reconditioning.

Credit Considerations

Nearly all countries who want to buy goods in the U. S. first must obtain a U. S. loan. Several European nations have applied to WAA for credit, but no credit structure has yet been set up for them. Of course, agents have been reselling WAA surplus tools abroad and will continue to see them.

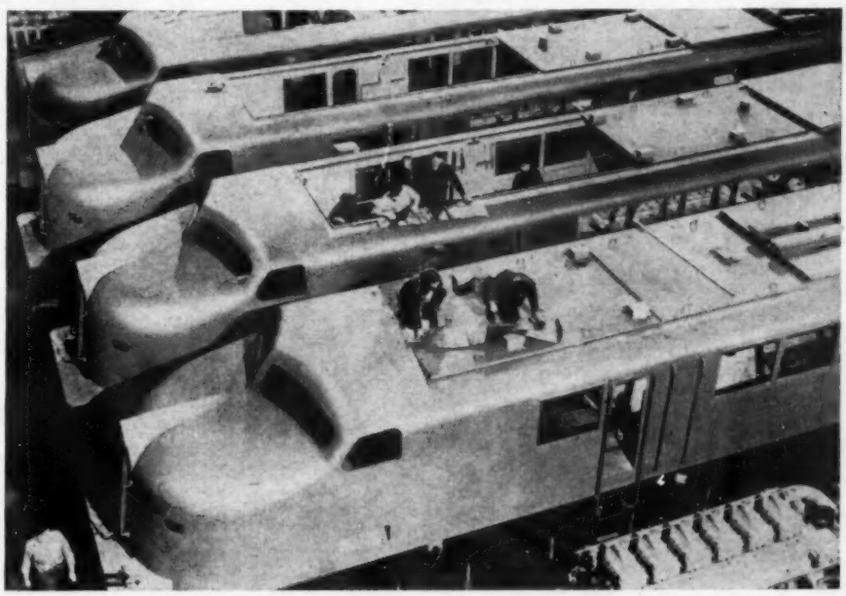
Pressure for Price Cuts in Steel Tends to Slow Placing of Orders

PITTSBURGH—From the tenor of Washington developments, there will be an energetic campaign to bring about price reductions in steel. The possibility that the Carnegie-Illinois Steel Company's reduction in extras will be followed by its competitors and may spread to products made by other units of U. S. Steel has been heightened by fairly good indications that the price of scrap may have seen its peak.

One company which has been an important factor in bidding up scrap prices got so much material in a recent period that it had to hold up car arrivals until the material could be unloaded.

The possibility that even Carnegie-Illinois Steel may make a second revision in prices, having the net effect of lowering them, should not be ruled out. Such a development may not come immediately, but could develop *after* an agreement is made with the United Steel Workers.

The trend in prices has an over-all effect upon new buying. There is a tendency to be slower in placing new commitments.

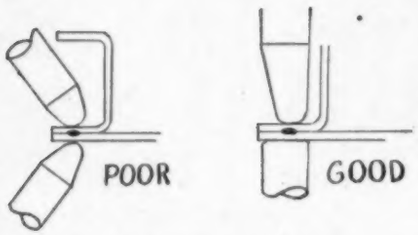


Mass Production Locomotives for Brazil—Twelve electric passenger locomotives for the Paulista Railway of Brazil have already been shipped by General Electric Co. Mass production methods in the company's Erie, Pa., shops are speeding the manufacture of these 182-ton, 3000 d.c. locomotives which are being specially built for operation over mountainous terrain. The locomotives are rated continuously at 4050 hp., with an over-all length of 76 ft. and a total of 270,000 lbs. on the driving axles

Poor Design May Stymie Shop Savings

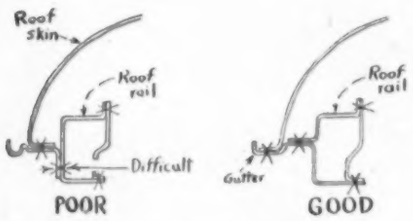
Cooperation between designers, process engineers and production men can cut costs, says Gordon, using resistance-welded designs to illustrate his suggestions at Detroit SAE meeting

BY CHESTER S. RICKER
DETROIT EDITOR

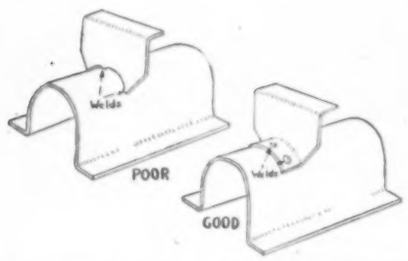


Avoid Interference. In welding flanges, it is desirable to get a straight action if possible rather than an angular one

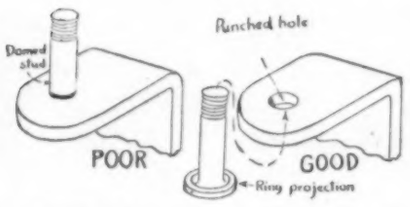
Match Weights, Gages. Projection welding is always better when the relative weights of the two mating parts are nearly the same



Plan Assemblies. Welding through holes is more difficult, slower, and often requires special welders that run up costs. Inspection is more difficult, and most welds are made blind by the operator because of their location



Provide Inherent Part Support. If parts have supports that locate them, expensive positioning fixtures can be eliminated, loading speeded and a better weld finally obtained



Anticipate Stress Loading. Domed studs welded to a bracket and subject to heavy stress proved unsatisfactory in service. The special stud with upset end having a projecting rim was substituted. This was inserted through a punched locating hole and proved adequate

DETROIT—John D. Gordon, general manager, Progressive Welder Company, Detroit, at a recent S.A.E. meeting here, took not only his own industry to task for failing to supply adequate information to design engineers, but also industry as a whole for failing properly to "process engineer" its products.

Designer Valuable

"The day has come when the design engineer who isn't satisfied to 'Let Harry worry about putting it together' can be one of the most valuable men in his organization," Gordon told the engineers. "We sometimes marvel that the things designed can be put together." He said that designers should "look twice" and ask themselves the question, "Am I taking advantage of the things which I know, the methods available and the tools which the shop has to build the design most economically?"

Savings Total $500,000

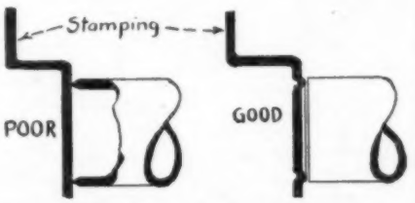
On a recent auto-body job, $500,000 was saved on initial equipment by proper process engineering for resistance welding. It is in the design stage that the manufacturing costs of such things as automobile bodies, refrigerators, stoves and the like are saved. Of two apparently identical designs, one may be extremely costly, the other relatively expensive, to make.

"Wages are not going to go down; if anything, they will go up. We might as well face that fact," Gordon continued, "and the design changes must be of such a nature that they reduce the effort on the part of the operator. If you don't make jobs easier, you won't get out production."

Welding equipment, he pointed out, should be handled just as presses are today. Punch presses are standard machines into which special dies are placed for each run. Progressive Welder now builds similar equipment into which special welding guns can be inserted. This reduces obsolescence. It reduces seasonal losses from style and model changes. Service is easier and replacement parts quickly available.

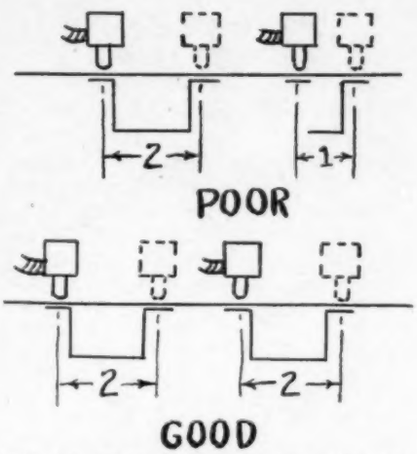
Use Inexpensive Equipment

Mr. Gordon insisted: "Don't have expensive welding equipment doing jobs which inexpensive equipment would do." He gave examples of how redesign of drip molding and roof rail on an automobile body reduced the cost of fixtures from $60,000 to $32,000, (No. 3 left). This also saved floor space which today cost from $7.50 and upwards per sq. ft. On the rear compartment of a body the simple expedient of allowing extra flange width at certain points permitted a two-electrode automatic



Simplest May Not Be Best. Better welds are obtained by putting the projection on the stamped part than by scarfing the end of a tube

Special Tooling May Cut Cost. Alternative method of attaching a flanged ferrule to another piece where there is limited clearance. Doing the job at one operation instead of several around the flange not only improved the weld by making it continuous, but took less than one-quarter the time



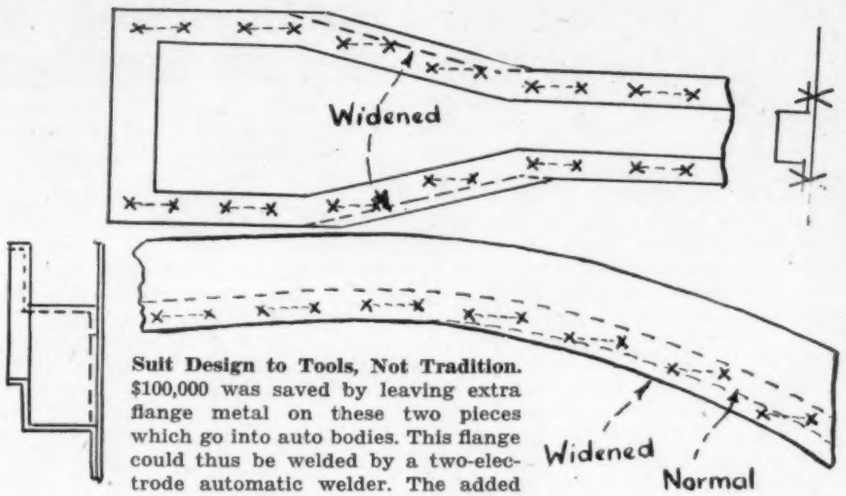
Maintain Uniform Spacing. By using the same spacing on as many of the parts as possible, the welding machines can be set and the operator does a better job with less effort and likelihood of spoiling the work. Hat shapes provide this example, Z bars are another

welder to be used. This not only reduced time of the operation, but also reduced initial equipment cost from $135,000 to $95,000, top right. He illustrated the use of rotary-table machines on which parts were assembled and then welded at a point remote from the operator. Some of these machines weld 1200 pieces per hour easily.

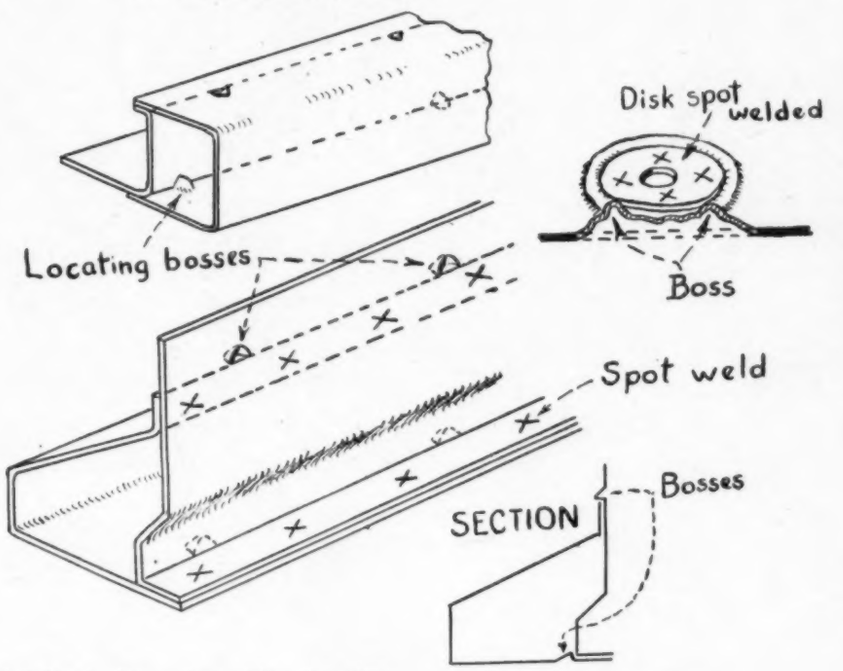
Cooperation Saves $182,800

The following example was given of the saving where process experts performed proper liaison between designers and manufacturing departments. Without changing the style, appearance or strength of parts or product, here is how the original and the final tooling worked out:

	Proposal	Revised	Saving
Men	24	16	8
Annual cost	$72,000	$48,000	$24,000
Welding guns	40	16	24
Assembly fixtures	8	4	4
Cost of equipment	$272,000	$125,200	$146,800
Floor space saving			$12,000
Savings, first-year total			$182,800



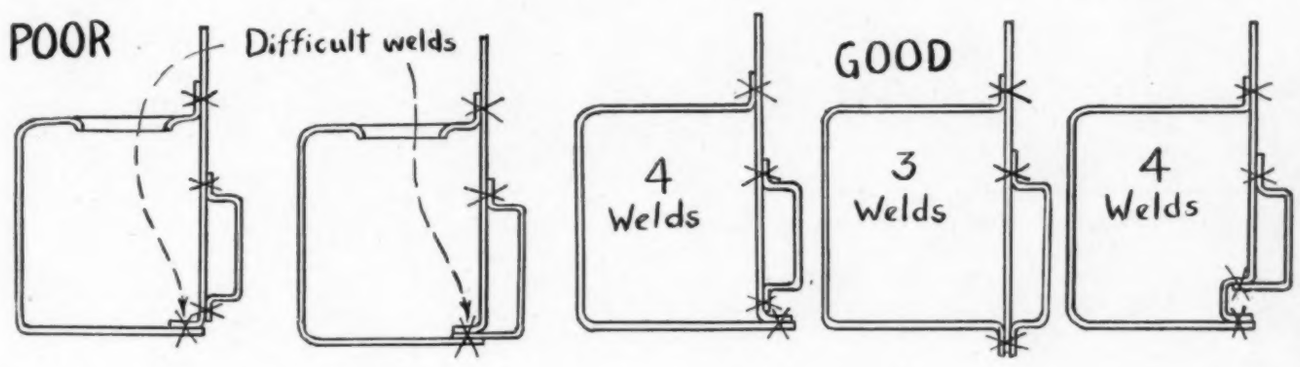
Suit Design to Tools, Not Tradition. $100,000 was saved by leaving extra flange metal on these two pieces which go into auto bodies. This flange could thus be welded by a two-electrode automatic welder. The added metal does not add to cost because it is taken from the scarf



Fabricate to Ease Assembly. Locating bosses, which can easily be struck in the parts when they are stamped out, cuts down the cost of locating fixtures and increases the rapidity of accurate assembly. It also reduces errors and scrap losses

Sketches below

Avoid Blind Welds. Here three alternative methods of welding a part replace blind welding through holes in the part. Keep welds outside whenever the appearance of the work will permit



Most of RFC-owned Machine Tools To be Sold or in Surplus by July 1

WASHINGTON — In response to criticism by the machine tool industry, spokesmen for Reconstruction Finance Corporation tell AMERICAN MACHINIST they are not withholding surplus tools from the market but on the contrary are selling or declaring them surplus as fast as possible.

RFC expects to have substantially all of its machines sold or surplussed by July 1, except those included under leases continued with war contractors at request of the Army and Navy. RFC officials say they agree with the industry that surplus tools sales should be pushed now, before the backlog threatens new production, and before prices decline further.

Interim Leases Opposed

The machine tool industry opposes retention by plant-owner lessees of machines on an interim lease basis, which permits cancellation by either lessee or the government on 30 days notice.

These interim agreements permitted private plant owners to go on using leased equipment, which otherwise would be in War Assets surplus, to facilitate employment and conversion to peace operations.

RFC on Aug. 12, 1946, telegraphed all field offices to notify interim lessees that all machines and equipment not purchased by them would be declared surplus on or before Oct. 6, 1946. This program was not strictly adhered to because of circumstances which RFC felt were beyond control of the lessees.

Nevertheless, the record shows a buying rush by lessees in October. Of the total $55 million (all figures are cost) inventory of interim lease tools on date of notice, $31 million worth remained in December, and the figure is now down to $25 million. What portion of the sales were due to the threat, and what purely voluntary, cannot be calculated.

$250 Million Worth Remain

Of $1,734,103,000 worth of machine tools inventoried on March 31, 1945, RFC still had but $558,745,529 worth last June 30, and now has an estimated $250 million worth on hand. The agency does not maintain current inventory because the cost is not considered justifiable. The June 30 inventory, with breakdown by types, is shown in the accompanying table.

This remaining inventory consists of $60 million worth under continuing lease agreements with plants having war contracts; $65 million worth (including the $25 million remaining on interim lease) in process of sale through clearance of privately-owned plants, and through declaration to surplus; and about $125 million worth located in RFC plants being declared surplus.

RFC Inventory of Machine Tools
As of June 30, 1946

Machines	Number	Cost
Boring	3,313	$ 48,131,374
Broaching	425	2,981,340
Drilling	11,557	56,507,213
Gear Cutting & Finishing	3,641	30,405,732
Grinding	20,653	124,011,119
Lathes	17,501	140,863,089
Milling	11,133	89,825,519
Planers	1,320	16,097,083
Miscellaneous	10,628	49,779,399
Unclassified	5	143,661
TOTAL	80,176	$558,745,529

From V-J day, or about Aug. 15, 1945, to Feb. 28 this year, RFC sold 35,637 tool units which cost $115,195,000, all located in privately owned plants. The balance of original inventory has been leased or declared surplus.

RFC Sells as Owner

RFC tools on lease to the operator of a privately-owned plant can be purchased in two ways: (1) the operator can exercise his option to purchase, in which case he must take all of the equipment furnished by the government under that lease, at a price usually in excess of War Assets prices; (2) he can buy from RFC at Clayton formula prices for standard items, and negotiated prices for special-purpose items, selecting what he wants, the balance to be removed at expense of RFC.

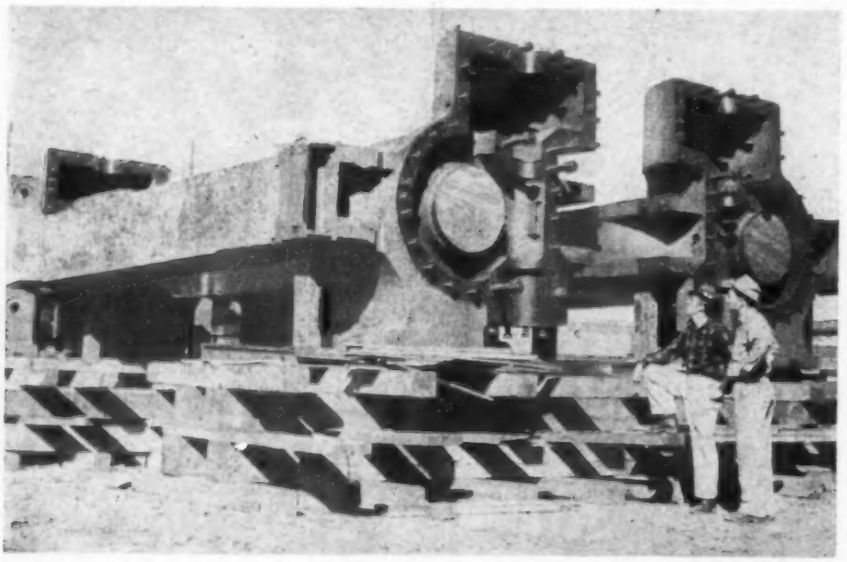
RFC tools located in RFC-owned plants can be bought by lessees who may wish to exercise their options, in which case they must buy the land, the plant, and all equipment in it—in accordance with their lease agreements.

Present Inventory Scattered

The present inventory of RFC tools is scattered in some 800 plants of which 250 to 300 are owned by RFC, which have more than half of the total equipment. Installations vary from one to several hundred machines per plant.

RFC machine tool sale prices are set by WAA Regulation 13 at Clayton formula on all standard general-purpose and some special equipment; prices on all others are negotiated, using the Clayton formula as a yardstick.

About 90% tool sales are for cash. Credit purchasers must pay not less than 15% in cash, with balance instalments running not over five years, at 4% interest. RFC prefers that local credit sources be used rather than its own. Title sometimes is retained by RFC.



Steel For West Coast—These two steel housings, weighing 100 tons each, are part of a set of 10 awaiting installation at Columbia Steel Co., at Pittsburg, Calif., in a $25,000,000 expansion. When installed, housings will form part of new 5-stand, 4-high cold reduction steel sheet and tinplate mill, capable of producing some 500,000 tons of flat steel products for Pacific markets

Interest at International Auto Show Centers Around Economical-type Cars

GENEVA—The International Auto Show, which ran from March 12-23, attracted considerable interest and was highlighted by characteristics and developments of cars and trucks. Few automobile manufacturers. including American exhibitors, could promise car deliveries in sufficient quantities to meet the immediate pent-up demand.

▸British dealers emphasized the delivery handicaps caused by England's coal shortage and its attendant slash in production. Where only a few months ago they could obtain immediate deliveries, they now are subject to waiting periods of at least two months.

▸Nineteen American cars were shown and won extensive inspection. Dealers handling American exhibits said all of the cars on display were sold and long waiting lists were in hand. Deliveries, they said, will be few and slow for many months.

Rear-Engine Model Shown

Immediate deliveries were available on the French nationalized Renault, a 4-cylinder sedan selling for about $1,600. Similarly, the Czech "Tatra," an 8-cylinder sedan with its engine in its fin-tailed rear, was ready for immediate purchase at around $5,000.

▸Prices quoted at the show for American cars were about double the U. S. price. A four-door DeSoto was listed for approximately $3,700 while a convertible coupe was close to $4,500. A Packard Clipper 6 was listed for $4,400, while a Custom Super Clipper was priced around $8,000.

▸The "Universal" jeep, the same model used by the Army, was selling for $3,400, with the chassis alone priced at $2,300.

Luxury Lines Expensive

High auto prices were reflected equally by other foreign manufacturers. A 4-cylinder, 4-place cabriolet "Fiat" (Italian) was priced at about $3,800. British cars aimed at the luxury trade were no lower. A 4-cylinder Sunbeam limousine was $3,000, the Wolseley 6-cylinder limousine "18" was nearly $4,000, and the Standard 14, another well-known British car, was $2,900. A 4-cylinder "Morris" limousine "8" was about $1,800 and the Morris "10" was $2,300.

▸The French "Peugeot" limousine, a 4-cylinder car, was $1,800, and the little Czech "Minor," a 2-cylinder, 4-passenger car, was the same price. Nearly all of the smaller cars offered about 40 miles to a gallon of gas and low operating costs.

Import Duty Boosts Price

One explanation for the high cost of American cars was given by the Cadillac dealer, who said a standard 4-door limousine, priced at about $5,000, cost about $1,000 in import duty, and an additional $700-$800 for transportation.

▸An Austin Co. official said the economic situation prevailing throughout Europe and large areas of the world would serve to continue demand for small-engine cars. The same official rejected ideas for placing the engine in the rear, such as demonstrated in France's new Renault model.

▸The Austin executive predicted British factories could not possibly catch up with the foreign demand for cars before the end of 1948 at the earliest. He said the Austin plants in England are only working three days a week and it is difficult to turn out 1,000 cars a week. Normal production is about 2,000 cars weekly.

Automatic Jacking Systems

The Austin Co. displayed for the first time two new models, the "110" and "120," both in the high-priced field. The "110," a 4-door sedan, is listed at about $7,000, while the "120" is $9,500. Sheer-line styling, described as typically British, is used, and both models feature electrically operated hydraulic jacking systems whereby either the front or back axle or both can be raised by operating a control on the floor directly in front of the driver.

▸The top section of the steering column is telescopic and may be lowered or raised slightly to adjust the steering wheel to the driver's height. All moving parts of the front steering are contained in an inside box.

Small-Engined Cars Favored

A General Motors Co. representative maintained the show should have been postponed a year. Pointing out cars like those on display cannot be delivered within reasonable time, he said it causes bad feeling to tempt people by showing them cars they can't obtain.

▸On the whole, while visitors admired American cars on display, they took most interest in the small engine, economical British, French and Italian cars. Several visitors said American motor cars, with their high gasoline consumption, were luxuries they could not afford.

Price Cutting Moves in Chicago Area Signal Return of Stiff Competion

CHICAGO — Developments in the Chicago metalworking trades demonstrate that days of stiff competition virtually have returned, and manufacturers are looking with a critical eye at production, sales and pricing policies in preparation for the battle ahead.

One obvious example of this development, of course, is the lowering of prices. International Harvester's aggressive chairman, Fowler McCormick, took the lead in lowering prices in the Chicago area. The company's reductions, which affected 163 products—chiefly in the industrial power, farm tractor and implement—and motor truck lines—will save consumers roughly $20 million a year based on current volume.

Box Car Prices Cut

Harvester's move was followed by a cut of 15% by Pullman-Standard in the price of box cars. Car prices were lowered to roughly $3,500 from $4,200. The price cuts resulted from a change in Pullman's production policies, which call for a greater integration of manufacturing and less subcontracting.

Pullman today is fabricating in its own shops many components formerly purchased from suppliers. The move will allow greater standardization of parts, and will increase output of cars, Pullman officials say. Orders for cars on the new basis already total 6,000. The first of the new cars, which will include doors, roofs and ends made by Pullman that were formerly purchased from suppliers, will be exhibited late in June.

Some Subcontracting Continues

Pullman, however, has no intention of manufacturing springs, draft gears, couplers, bolsters, and cast steel truck side frames, all items that are normally obtained from outside sources.

Still another indication that mass-production will lead to lower prices was given by Crane Co. The firm announced a greater concentration on valves, pipes and plumbing fixtures for low cost housing, and will emphasize large output of medium and lower cost items rather than a small volume of deluxe fixtures.

Gaging Business

Metalworking Production at Peak

Despite record-shattering production, most companies in the metalworking industries still possess a large volume of unfilled orders. It is not uncommon for manufacturers to have backlogs of from six months to one year. And in certain lines, such as textile machinery, the pile-up of business will last much longer than that. Shortages continue serious, but are gradually diminishing. With labor rates 80-100% higher than in 1941, production costs are an important problem.

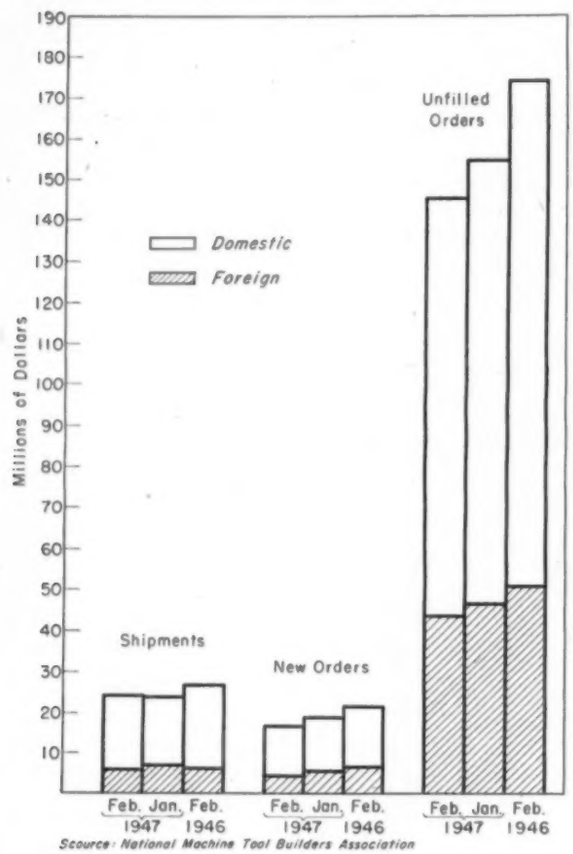
Machine Tool Sales Spotty

Incoming machine tool business has been extremely spotty. Some builders report that the market appears firmer, inquiries are increasing and new orders booked have improved. Nevertheless backlogs in most cases are still declining. Most current sales are being made in small lots of single machines or, at best, three or four machines at a time.

Big customers, especially automobile companies, have not been in the market lately with important tooling programs. Many machine tool builders, however, are convinced that Detroit orders for '49 model tooling will be placed in substantial volume in the next two or three months. Some builders are securing new business from customers who cannot get satisfactory delivery from other builders. Certain companies are adapting standard machines to new types of work to get into new markets.

Tool Inquiries Large

Many machine tool builders say that outstanding quotations are very large and a sizable percentage of these inquiries should be converted into orders soon. Among the factors contributing to present hesitancy are uncertainties about future labor rates, nervousness about consumer resistance to high prices and unwillingness to risk new capital until national policies are more clearly defined. In the export market in particular, absence of adequate financing and shortage of dollars are retarding sales. Never have deliveries of machine tools been quoted over such a wide time range. Some standard machines can be secured in one to three weeks, whereas special-purpose machines and large standard machines, such as planers, are quoted for eight to twelve months' delivery.



Source: National Machine Tool Builders Association

Foreign Cancellations Rise—In the first two months of 1947, machine tool business held fairly steady. The most startling change was the rise in the dollar value of foreign cancellations which shot up from 17.7% in January to 55.2% in February. Total industry shipments for February in millions of dollars totalled 26.5 with foreign shipments an even 25% of that figure. New orders dropped domestically to 16.7 and to 4.1 in the foreign market. Domestic cancellations showed a slight rise of .2, while the industry-wide back log dropped 9.5 to 145.2

Motor Car Output Soaring

Automotive assemblies are going along at a rate close to 105,000 units a week, which is as high as can be expected with steel and other materials hard to get. Here and there temporary halts have been necessary because component parts deliveries have not kept pace with assembly-line requirements, but on the whole operations have been maintained on a high plateau.

It is believed possible that enough steel may become available in the next few months to raise car output to 115,000 a week, and there is some talk out of Pittsburgh that the steel supply late this year will merit a car production rate of 140,000 units weekly, if retail sales will stand such a rate. It is the prevailing opinion in the automotive industry that car manufacturers will be able to sell all the cars they can make in '47.

New Record in Farm Equipment

With the two big strikes in the farm implement industry settled, operations are expanding. A new record for farm equipment production is likely to be established during the balance of this year. Output of small tractors will attain a new peak. Plant expansion programs are well along and considerable new capacity should be coming into production the latter half of '47. J. I. Case is said to be preparing to tool up for new engine manufacture at its Bettendorf, Iowa, plant.

Clock Makers Achieve Record

Metalworking companies making a variety of household products are working hard to reduce comfortably large backlogs. Electric refrigerator and air-conditioning unit producers are in the midst of a lush market. Electric clock people are turning out units at the highest rate on record. Business is still very good in radio receiving sets and in washing machines. Commercial kitchen equipment is moving well too.

Cold-Rolled Steel Eases

The steel rate has slumped a bit, but continues close to full practical capacity. Tightness in cold-rolled products is easing, partly because users are buying less expensive hot-rolled stock instead. Price concessions in extras by Carnegie-Illinois are expected to be extended to other producers. Alloy steel demand this year will set a new peacetime record, with output estimated roughly at 7 million tons. Production in 1940 was 4.9 million tons and in 1937 was 3.4 million tons.

Labor Legislation Decisions At Hand; No Drastic Anti-strike Action Looms

WASHINGTON—This is the month of decision on labor legislation for the first Republican Congress since '930. It is measuring the size of brake needed to halt the New Deal growth of labor union power.

Alert employers facing labor disputes know, however, that a new law will not solve them, will not write the terms of labor contracts. That's compulsory arbitration, and it's not in sight.

What will Congress do? It will merely change the rules of the game. It will strengthen the hand of management in dealing with strikers, make strikes more risky. This, it is believed, will reduce labor strife.

Strike Stopgap Likely

Strikes over new contract terms will not be outlawed, with one exception. Congress will try, either through government seizure or injunction, to stop strikes which hurt the country. It wants to retain in peacetime the wartime device which derailed the coal strike.

Strikes over union jurisdiction or in violation of contract, as well as secondary boycotts, will be made taboo.

Any new mediation board or service will only help settle disputes, not impose decisions on unwilling parties.

Strike Possibilities Remote

It is evident that none of the proposed curbs will prevent a strike in steel, automobiles and electrical manufacturing, where major settlements have yet to be made, if either side remains stubborn. The government, if given the power, might act to end a strike in one of these industries, but only when the country's welfare became endangered. It would not be likely to use injunctive power to block the onset of a strike except in a critical utility or where health and safety are involved.

Possibility of widespread strikes in metalworking industries, as in other fields, is remote. Workers don't have the stomach for them. Union treasuries are low.

Important, also, is the greater risk involved. Even before Congress has acted, National Labor Relations Board decisions have turned against strikers.

Sobering Effect Seen

Strikes lost by the powerful CIO auto workers at J. I. Case and Allis-Chalmers will sober many union leaders previously hell-bent for striking. They will be less inclined to strike over a difference of a few cents.

An example: CIO rubber workers' acceptance of 11½-cent increase, with early reopening, rather than striking. This figure now becomes the rock bottom for CIO's "Big Three"—steel, automobile and electrical workers—whose settlements will probably run between that and 15¢. The rubber workers will then try to make up the difference.

Rail Tieup Dissipates

Another railroad strike is not in the cards this year. Congress will give the government powers to prevent one. The moratorium on changes in working rules, agreed to by the engineers and trainmen after last year's strike, ends May 24. Changes desired will become known this month. Non-operating unions are asking a 20¢ hourly wage boost.

There won't be a boost in the minimum wage. Not this year. It will be a political issue in 1948, when the minimum is likely to be raised from 40 to 55 or 65¢.

Spiraling Scrap Prices Break As Supply Eases in Cleveland

CLEVELAND—Receipt of near record-breaking amounts of open hearth scrap during last month and the approach of open weather has put a crimp in skyrocketing scrap prices in this area. Some mills that had been begging for scrap in January and February have supplied their yards to a point they have withdrawn from buying markets.

A large producer in this area withdrew all long-range commitments and is buying on a day-to-day basis. Scrap dealers in the Cleveland area have been scurrying to find other nearby markets willing to pay premium prices.

Charles M. White, president of Republic Steel Corp. here, sees no basis for reducing steel prices because of an easing scrap metal market.

Operations Criticized

Tom L. Smith, Jr., executive vice president of the Pressed Metal Institute, made a scathing attack on brokers and dealers who obtain sheets direct from mills and sell them to hard-pressed metalworking firms at well over the established price base.

Cleveland producers agree with basic steel executives in Pittsburgh that trade in what is termed a "gray market" is disturbing. Many firms are boycotting proffered steel unless it comes from legitimate suppliers at regular prices. "Gray market" operators reportedly obtain scrap which they offer to hard-pressed small users in return for steel products.

Handling Boosts Sheet Prices

The dealings in 16 and 20 gage sheets have boosted prices to more than $200 a ton. A stamper supplies scrap to a dealer who in turn sells it to a steel maker with too much ingot capacity for his rolling equipment. The scrap dealer gets ingots in return. The ingots are then shipped to rolling mills who are short and only too happy to do the rolling job.

Inexperienced operators have contributed to boosting prices by bidding against each other in spot metal markets. They have failed to analyze their needs and refuse to adhere to a "hold-the-line" policy.

VIBRATIONLESS PUNCH PRESS MAKES 1,800 STROKES PER MIN.

CLEVELAND — A high-speed punch press which operates up to 1,800 strokes per min. with accurate register has just been announced by Lemco Products, Inc. Called "Hypermatic Press," it is made in 10 and 50-ton models with minimum stock feed on the 10-ton model of 5,000 lineal in. per min., and 10,000 on the larger press.

The press is vibrationless, is not bolted to the floor and no cement base is used. Force developed in the press has an opposing similar force, and they absorb each other.

Tooling Completed on New Type Joint for Busses and Trucks

DETROIT—Tooling has been completed on a new type of constant velocity universal joint designed by Gear Grinding Machine Co. primarily for heavy-duty propeller shaft applications on busses and trucks. Tests indicate that the new joints are entirely free from torsional vibrations at all operating angles and speeds.

Transmission of torque from one member to the other is by means of steel balls positioned in intersecting raceways. The members are held together by a heavy ball socket in the center which maintains true concentricity. The virtue of the device lies largely in the relief it gives design engineers, who can go about their work to produce the best condition of engine and axle locations.

Many Machines Shown for First Time In Exhibits at Western Metal Show

OAKLAND, CALIF.—Most of the machines given their first showing at the Western Metal Congress in Oakland, Mar. 22-27, were produced by Pacific Coast manufacturers, the majority of exhibits by eastern companies having been transferred in toto from the recent show at Atlantic City.

▸More than 200 displays, two-thirds of them from the east, were set up in Oakland's Municipal Auditorium and Exposition Building in conjunction with a program of some 75 technical papers, lecture courses and roundtable discussions. The American Welding Society and the American Foundrymen's Association held special sessions concurrently with the Congress.

▸Making initial appearances were Benbow's TracTroly safety conductor system, Air-Speed's pneumatic saw and file, Dreis' steel squaring shears, Curley Electric's spot welder, Quijada's portable power pipe threader, Tobey International's featherweight flatbed trucks, Logan's shaper and General Foundry Service Corp.'s aluminum foundry flask equipment.

Secret Castings Shown

Also given a first public showing were previously war-secret castings produced by the Frank Howard Foundry, complicated core designs in magnesium, aluminum, stainless and high-alloy steel, bronze and brass.

▸Benbow's insulated trolley system for cranes, monorails and other industrial uses offers five-tooth multiple point contact, eliminating arcing, sparking and single phasing of motors. The "Trac Conductor," capacity 225 amp., totally encases the copper conductor bar in a molded synthetic rubber sheath with slotted rack openings underneath.

▸Unique features of the Air-Speed saw and file for precision work include an air regulator, 1 in. in diameter, giving a graduated control to the speed of the mechanism. Dreis steel squaring shears, of all steel welded construction, are offered in electric power, rated at 14-gage, and air power, 16-gage capacity, models. In the electric model, the ram is pre-loaded by die springs that store power on the up stroke and deliver it on the down under control of the eccentrics, eliminating overload danger and cutting out the fly wheel, clutch and clutch-operating mechanisms.

Combined Unit Demonstrated

Curley Electric's combined spot welder-heat treater, operating at 110 or 220 v., will heat-treat small parts, spotweld up to 18-gage steel and unspot it at a mistake. The Quijada pipe threader has automatic chucks and six individual quick-change die set heads, ½ to 2 in., each with a built-in oil line.

▸Logan's moderately-priced 7-in. shaper handles straight and angular cuts, squaring, machining and slotting with a maximum 7⅝ in. stroke, with the exclusive feature of a toolhead which may be swiveled and instantly re-set by tapered locating pins. Tobey International is making heavy-duty flatbed trucks of duraluminum, equal to steel in tensile properties and non-magnetic. R & K Industrial products showed solid molded-on rubber tires on cast magnesium or aluminum wheels, for heavy-duty service at lower unit cost, increased load capacity and longer wheel life.

Rubber Gaskets Emphasized

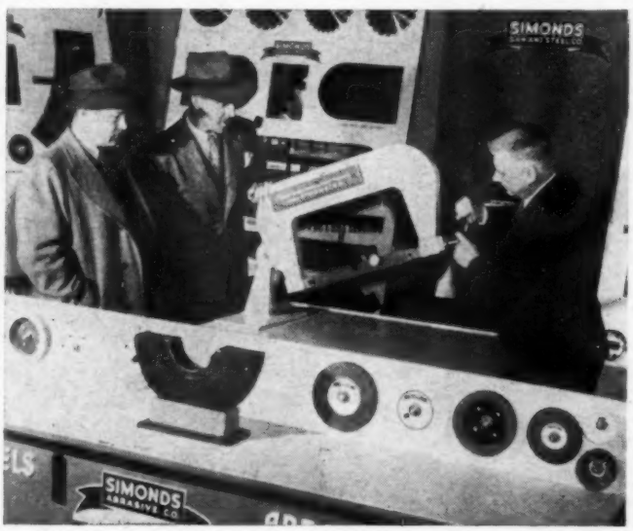
▸Aluminum sand molding flasks for metal casting and aluminum jackets were displayed by General Foundry Service, stressing the use of rubber gaskets to prevent sand sifting into working parts and a new design for the inside of the flask to eliminate the use of sand stripping.

Vacu-Blast Co. demonstrated its blast-cleaning machine, a device equipped with a vacuum return to allow cleaning or refinishing of hard surfaces without a sandblasting room.

Discusses Electron Microscopy

Among technical presentations was the description of a formerly wartime secret process, electron microscopy, by Dr. David Harker, of the General Electric research laboratory at Schenectady.

Giant Grinding Wheel—Visitors inspect a Norton Co. display featuring the company's new 32 alundum grinding wheels, abrasive wheels claimed to cut faster and cooler, last longer and require fewer dressings, and centering on a giant-size 1,000-lb. wheel. Produced by a patented process which forms many-pointed crystals without crushing, 32 alundum is over 99% pure fused alumina



Tension Device—C. C. Strout, Pacific Coast specialist for Simonds Saw & Steel Co., Fitchburg, Mass., demonstrates a new "Simometer" device designed to insure proper tension in a power hacksaw, eliminate guesswork and result in reduced breakage of blades, straighter cuts. Simometer was on exhibition for the first time at the Western Metal Congress at Oakland, Calif.

Detroit

GRAY IRON CASTINGS REMAIN TIGHT . . . FORD ELIMINATES FINS IN BLOCK INTERIORS . . . NEW ENGINES FOR BETTER FUELS SEEN

Castings Capacity Varied

Gray iron castings continue about as hard to get as they were during the most difficult periods of the war. Nonferrous and steel casting capacity can be found without too great difficulty, but availability stops there.

▸ Not only is capacity itself hard to find, but sparse tonnages of materials also are imposing handicaps on output along with irregular quality. Increases in prices—which have continued upward steadily from the early war days—do not appear to help the situation greatly; as long as cleaner, less arduous jobs are available, workers apparently are turning their backs on the foundries.

GM Enlarges Foundry Division

This is apparently the reason General Motors is continuing to enlarge its foundry division, created last July mainly because outside capacity was insufficient to supply castings needs of the company. A new malleable iron foundry will be built at Danville, Ill., and a gray iron foundry at Defiance, Ohio. The division now operates foundries in Lockport, N. Y., Saginaw, Mich., and Danville.

▸ On the score of castings, Ford has introduced a new technique aimed at eliminating unwanted fins in block interiors. Customarily, sections of the sand cores are coated, then assembled; crevices occasionally occur which create the fins. Now Ford has developed a means in its new $3 million core room to assemble the entire core before dipping it into the protective coating. The core comes out of the dipping tank and is automatically mounted on a worm screw which spins it, removing excess coating compound. Ford people, traditional leaders in foundry techniques dating back to the first days of "Cast Iron Charley" Sorensen, are highly pleased over their development.

Cadillac Spending $15 Million

Cadillac Motor Car Division is expanding as befits its position as the car maker whose orders may bulk larger in proportion to normal volume and plant capacity than any other producer. A $15 million expansion program is well past the halfway mark in expenditures, if not in completed plant.

▸ Practically completed are new facilities for casting gray iron. New cupolas, new sand-handling equipment, a larger core room, and better methods of cleaning and baking are included in this program. A new plating department is in operation, handling zinc, copper, nickel, and chromium. The chassis, body, and final assembly lines have been recycled, with added space in a new building which permits the lines to flow without turns from start to finish. A new engineering laboratory is also included in the program.

▸ From the looks of tooling orders around Detroit, Cadillac may have some of the really newest new models when 1948 introduction season rolls around. Orders at equipment shops point to the likelihood of a new engine—one which may be better suited to higher octane fuels—as well as a considerably revamped body.

Economical Operation Sought

Recent remarks by Cadillac officials, also indicate the direction of forward development. They are thinking steadfastly in terms of economical operation — not only with engines using better fuels, but also in terms of weight reduction, streamlining to reduce wind resistance and lowering of the internal friction characteristics of powerplants, brake systems, and transmissions. In the new laboratory, too, a variety of testing projects are going forward around plastics, aluminum, synthetic materials of various sorts, and fabrics.

▸ Meanwhile, the order blanks in Cadillac dealer hands are of such size that inevitably some of the buyers now on the lists won't be reached until the '48's begin to roll off the lines.

Ford Hires Chrysler Men

A few months ago Ford was considerably in the limelight with its extensive hirings of General Motors engineering people. Now Ford seems to have turned from that storehouse of experts to Chrysler, and in recent weeks has drawn on the third member of autodom's Big Three. Chrysler is none too happy about being flattered by the attentions of the rapidly expanding River Rouge member of the industry—particularly since it has been losing draftsmen to General Motors payrolls.

▸ Ford is matching its enlarged engineering staff with larger employment in its giant tool and die shop. A few months ago this shop was comparatively inactive. During recent weeks, however, all seniority people have been rehired, and the company is advertising for skilled men of nearly all classifications.

▸ The enlarged drafting staffs in General Motors follow a period in the recent past during which large numbers of the company's rule and compass men were unable to find themselves jobs after layoffs for indefinite periods. Their returns to work, plus the hirings from the Chrysler and other drafting rooms, would indicate that GM has some highly important programs ahead—if not for 1948 models, next fall, then certainly for 1949's.

Transition From War To Peace—Less than a year ago workmen were removing the last vestiges of war from the huge Willow Run plant where bombers were turned out for Allied victories. Today a pair of 2,000-ft. long body trim lines each complete 45 Kaiser Frazer bodies an hour. The plant is equipped with two complete assembly lines from raw stampings to final inspection

Peirce Urges Use of Metric System At Annual ASTE Meeting in Houston

HOUSTON—"Engineers must begin to think now about abolishing the antiquated English system of measurment and adopt the simpler metric system, if we are to keep pace with the rest of the mass-production countries in the world," said W. B. Peirce, newly elected president of the American Society of Tool Engineers, at the 15th annual meeting of the society here March 19-22.

Mr. Peirce, vice president in charge of research for the Flannery Bolt Company, Bridgeville, Pa., warned that industry must become more alert to intelligent "standardization."

M. B. Peirce

Albert M. Sargent of Detroit, retiring president, stated revolutionary changes in future homes will result from tool engineer designs of machinery for standardization of parts and streamlining production, bringing about great reductions in costs. Mr. Sargent is chairman of the board, president and general manager of the Pioneer Engineering and Manufacturing, Pioneer Pump and Manufacturing Company and Pioneer Industries.

Lincoln Issues Warning

J. F. Lincoln, president of Lincoln Electric Company, told the engineers that the United States is heading for a totalitarian government under the present labor-management setup. Because management has no control over the worker, production efficient has gone down to a startling extent, he said.

"There are two ways out," Mr. Lincoln asserted. "One is to go into dictatorship such as has been used by Fascism, Communism and Nazism, and the other is to bring back competition for jobs in the same way we had it before the era of union domination and unemployment insurance.

"We cannot continue the chaos of collective bargaining with its war and destruction," Mr. Lincoln added. "That will mean the disappearance of our economy and inevitably lead to totalitarianism."

Roster of Officers

Other officers elected were: I. F. Holland of Hartford, Conn., first vice president; R. B. Douglas of Montreal, Quebec, second vice president; George C. Johnson of Rockford, Ill., third vice president; W. A. Dawson of Hamilton, Ont., secretary, and V. H. Ericson of Worcester, Mass., treasurer. H. E. Conrad was reelected executive secretary.

Data to Avert Future Tragedies Sought in Plating Plant Blast

SAN FRANCISCO—The tragic explosion, which claimed the lives of 17 employees at the O'Connor Electroplating plant here on Feb. 20, has prompted an investigation aimed at recommending precautionary measures to avoid such blasts in the future.

Testimony before a coroner's jury revealed a basket made of tenite rods was being dipped into a mixture of perchloric acid and acetic anhydride at the time the blast wrecked the building. The company was working on a subcontract for plating aluminum parts at the time.

Process Had Been Secret

The exact process had been secret, although patent applications had been filed. First use of the chemicals was evidently in September, 1946, when a 59-gal. batch was used in a crockery vat. A second batch was mixed Feb. 15, five days before the fatal explosion, and was contained in a plastic-lined steel tank of 300-gal. capacity. It was estimated the two vats contained about 3,600 lb. of mixture at the time of the blast.

Preventive Steps Ttaken

The City Council immediately passed an emergency ordinance designating areas in which explosive or otherwise dangerous chemicals can be used. Existing codes were said to be conflicting and confusing.

Fire Underwriters are investigating and are expected to make a complete report with recommendations for averting such industrial disasters in the future.

Lundberg Elected President Of Screw Machine Association

CLEVELAND — Realizing some of their former customers are becoming competitive threats, National Screw Machine Products Association members decided the industry's thinking must be changed from high volume production of war years to lower volume output. The decision was reached at a four-day meeting ending March 22.

It was pointed out that during the war, the number of firms making industry products was at an all-time high of 1,300. Today the industry has about 1,000 shops, with prospects the number will be reduced considerably by the end of the year.

Service, Quality Stressed

Ted Lundberg of Lundberg Screw Products Co., newly elected association president, urged members to remember that service and quality of work is worth more to the buyer than price. He predicted that with keener type of competition looming, prices will hit a downward trend.

Members resolved to request the Internal Revenue Department to allow the difference between the Clayton formula and fixed price on machine tools as an immediate obsolescence factor. When the government cut prices on surplus tools from the Clayton formula, the industry suffered untold losses.

The association will be represented in working with the American Standards Association on standards.

Officers Elected

Quality control, unheard of in the industry until World War II, was lauded by George M. Wentz, technical advisor of the association, as a big step toward greater efficiency in cutting the percentage of rejections.

Other officers named: Robert Chestnut of Aluminum Co. of America, vice president; William N. Grass of M. J. Grass Screw Machine Products Co., treasurer; and Orrin B. Werntz, manager and counsel of the association for the past 10 years, reelected executive secretary.

End of Allis Strike Hailed

CHICAGO—The end of the Allis-Chalmers strike, which involved a $65,000,000 production loss by the company as well as a huge payroll loss, comes as welcome news to many metalworking and fabricating firms in the Chicago area that bought items from Allis or sold components to the firm. The tremendous range of Allis products, all the way from precision castings to farm equipment, affected a wide variety of concerns.

Washington

MOST MACHINES TABBED FOR SCRAP BUILT SINCE '40 . . . MOTORS SALVAGED . . . RFC MAY GET SWPC LOAN FUNCTIONS

WAA's Scrap Contribution

War Assets Administration reports 95% of the 80,000 obsolete special-purpose and "over-age" machine tools being offered for scrap salvage were manufactured since 1940. Machine tool industry spokesmen were under the impression WAA was offering only "very old machines."

The sale will channel from 250,000 to 300,000 tons of unsalvagable scrap to the steel industry. WAA is also combing its stocks for "beat-up" general-purpose machines to be scrapped. Offerings of all salvage machines are under competitive bids, not less than 10 units, in most regions.

Motors Sold at Half Price

About 75% of salvage from scrap machines is electric motors. Removal of gears for salvage was found too expensive. Nearly all fractional hp. motors are sold for general purposes. About half of motors over 1 hp. can be used only on machine tools, the remainder for general purposes. Motors in place are selling at 50% of cost. WAA could get 65% of cost by removing them, but would gain nothing.

Tools for Special Contracts

Little known is the fact WAA is leasing long-supply machine tools to military contractors at the request of the Army and Navy. These contractors do not want to buy the tools because the special jobs they are performing will play out. Extent of such leasing, and to whom, are not recorded in Washington as yet, because regional offices are authorized to act on their own initiative. There is no leasing to educational institutions. In emergency, the government could requisition machines sold to schools.

RFC Silent on Greek Loan

RFC has no official comment on proposals it could make a hurry loan to Greece and be paid back later out of appropriations. Question of whether the President, on his own initiative, could order the loan scares RFC speechless. If the loan mission to Greece includes military personnel, the Commander-in-Chief could order them supplied out of existing funds, or by transfer from other military units. The President's action in the Greek situation is being watched closely by several agencies.

Extension of Export Controls

President Truman's request to Congress for a year's extension of export controls appears to be the only official mobilization step since his advocation of aid to Greece and Turkey to oppose Communist pressure. Any direct moves toward mobilization, such as pilot plant production lines, designations of critical plants for standby, and stockpiling of strategic materials, are not being discussed. Because it represents a major step in foreign policy, Congress wants plenty of advance information.

The U. S. has huge stores of weapons in reserve and could strongly arm the Mediterranean opposition to Communism. The next step would be warships and airplanes. It is held doubtful that Greece and Turkey have enough plants, or could build them soon enough, to use many machine tools in this emergency. Probably all they could use would come out of American surplus.

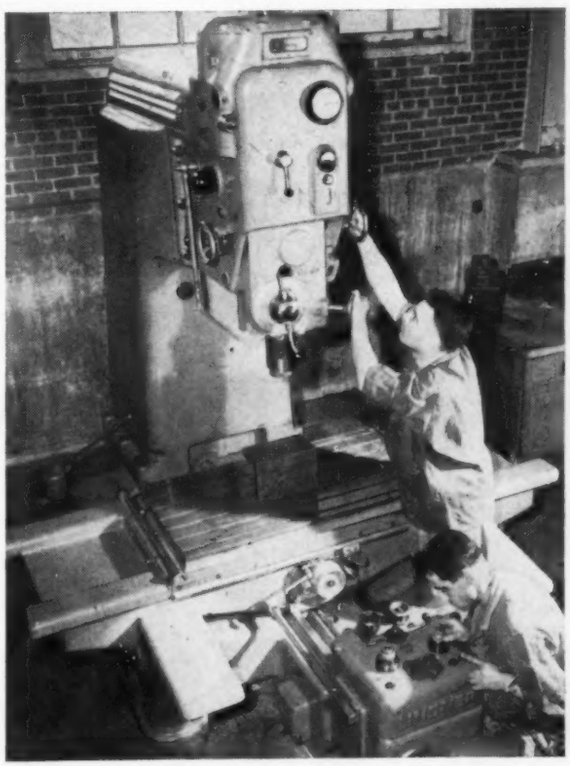
Antitrust Suit Filed

A civil antitrust action charging the Grinding Wheel Manufacturers Association and five member corporations with fixing prices of grinding wheels and other abrasives in violation of the Sherman Antitrust Law was filed March 26 in Boston by the Dep't. of Justice. The five members are: Norton Co., Worcester, Mass.; The Carborundum Co., Niagara Falls, N. Y.; Bay State Abrasives Products Co., Inc., Westboro, Mass.; Simonds Abrasive Co., Philadelphia; and Macklin Co., Jackson, Mich.

Twenty-six other association members are named as co-conspirators. The latter and the defendant companies produce about 95% of all abrasives manufactured in the U. S.

Loans for Small Business

House passed and sent to Senate a bill which will authorize RFC to resume priorities and loans to small business for surplus plants. When Smaller War Plants Corp. was transferred last Dec. 31 to Commerce Department and RFC, the Attorney General said SWPC's functions could be continued legally by RFC. Later, Lindsay C. Warren, Comptroller General, determined RFC did not have authority to continue SWPC's functions, and they ended March 11. RFC says it will resume its plant preferences and loans soon as the bill is signed. Veterans and small business put the heat on Congress.



German Machine Tools On Exhibit — This Lindner jig borer, controlled by optical and hydraulic system, is one of the most valuable German machine tools at the Frankford Arsenal. Bottom right is the optical control system which positions the borer within 1/1000 of a mm. The Frankford Arsenal is the scene of a month-long exhibit and demonstration of German machine tools, which will end May 2. The exhibit is sponsored by OTS, the Office of the Chief of Ordnance of the War Department, NMTBA, and the Army Ordnance Association. Some of the tools, while as yet untested, may suggest changes in American practices

Machine Tool Sales Outlook Reviewed at AMTDA Spring Meeting

CHICAGO—Sales and service problems, the surplus property situation, the value of comparative industry statistics and the forthcoming Machine Tool Show were main topics of discussion at the twenty-third Spring Meeting of The American Machine Tool Distributors' Association at the Edgewater Beach Hotel, March 24-25.

Burnham Finney, editor of AMERICAN MACHINIST, spoke on "One World: Mechanized" at the dinner session. George Habicht, Jr., president of the association and president of Marshall & Huschart Machinery Co., Chicago, presided.

Pease Cites Sales Outlook

The immediate outlook for sales of machine tools is confused, declared Herbert H. Pease, president, National Machine Tool Builders' Association, and president, New Britain Machine Co., New Britain, Conn. WAA's disposal of tremendous quantities of government-owned tools has deprived the industry of much business. Basically, however, there is a potential demand for cost and time-saving production machinery.

It is impossible for the machine tool industry, with a normal capacity to produce $600 million a year, to live on the $19 million of incoming business a month, such as prevailed in January, Mr. Pease said.

Emergency Quota Inadequate

Though joint Army and Navy teams are now engaged in tagging some 80,000 surplus machines which should be retained as a strategic reserve, Mr. Pease stated this total is inadequate and legislation should be adopted permitting an additional 200,000 to be so earmarked.

It is necessary for the machine tool industry to have all of the domestic business plus such foreign business as it can get, if it is to survive, remarked Mr. Pease. It must have tariff protection.

"We will have a foreign market for types of machines not built abroad and for simple types of machines if we can compete in price with our foreign competition as the rest of the world becomes more self-sufficient and more industrialized," the speaker asserted.

Severe World Competition

The industry is faced with severe competition in world markets from countries such as Britain, Czechoslovakia and Italy where machines can be built at about half U. S. labor rates. It would be optimistic to expect as large purchases abroad as heretofore because future loans to other countries will be more carefully scrutinized.

To have prices for goods higher than the public can afford is the one thing which will turn our prosperity into a depression, said Mr. Pease. The fact is not realized widely enough that greater use of improved high-production, cost-reducing machines is more than ever important to keep our economy sound.

Even if machine tool builders take advantage of every known economy in production, their prices must be higher than ever before because of reduced volume and high labor rates. A productive hour in the machine shop now costs $5, or twice the pre-war level. Costs of materials and parts have risen proportionately.

Advocates Free Depreciation

Mr. Pease said that a corporation buying new machine tools today is trying to do it out of depreciation reserves based on the cost of machines 16 years ago, and this basis is inadequate. Moreover, it is almost impossible for companies to secure new equity capital under present conditions. He advocated the allowance of free depreciation by the Internal Revenue Department. Buyers would be permitted to set up in the year a machine is bought a depreciation reserve equal in dollar value to the dollars spent. New machine tools, said Mr. Pease, would be bought with confidence under such a Treasury ruling. If depreciation were taken all in one year, cost to the government would be only the delay of one year in taxes.

Giebel Scores Surplus Program

It is self-evident that the WAA surplus sales program was developed with no thought of protecting the interests of the new machine tool industry, reported Robert L. Giebel, chairman, committee on surplus property, and president, Giebel, Inc., New York City.

The fixed price surplus policy, said Mr. Giebel, stimulated sales for a short time, but only a dent has been made in the total number of surplus machines. Inventories are made over and over but the result is always the same, confusion, Mr. Giebel charged. At Linden, N. J., warehouse, hundreds of precision machine tools were left out in the weather, while obsolete designs, inexpensive and damaged machines were kept under cover, he asserted.

Sales Survey Reported

Distributors should hire men from co-op schools who have had shop as well as engineering experience and send them to machine tool builders' plants for training, said George J. Keller, chairman of the association's sales and service committee and president, George Keller Machinery Co., Buffalo, in presenting results of a survey among members. Graduate engineers should be paid more and should be sold on the future of the industry. Factory field service should be available, the service men helping to educate distributors' salesmen to take care of minor complaints.

Mr. Keller advocated elimination of escalator clauses wherever possible. If they must be used, builders should agree on a standard clause for distributors to use. Distributors feel that the training given by local technical schools is inadequate and that manufacturers should train men for sales and sales engineering work, he reported. It is up to the distributors, however, to choose men who will work out well in their respec-

Speakers at AMTDA Meeting

Herbert H. Pease

Robert L. Giebel

George Habicht, Jr.

SURPLUS DISPOSAL PLAN GAINS AMTDA APPROVAL

CHICAGO — A five-point program for disposal of surplus machine tools, drafted by a committee on surplus property and presented by the committee chairman, Robert L. Giebel of New York City, was adopted unanimously by The American Machine Tool Distributors' Association at the Spring meeting here. The recommendations follow:

(1) Quickly tag machines for war reserve and, if approved by Congress, those required by national security reserve; (2) after removing motors and controls, scrap remaining special and standard machines which, because of design, age, abuse or exposure, have no commercial value; (3) give machines in long supply to schools and governmental organizations at cost of crating and transportation only, the recipient agreeing to retain the machines for at least 10 years; (4) reinventory remaining machines and relocate them where practical in warehouses according to make, size and type; (5) operate each warehouse as a distinct selling unit, treating all buyers on an equal basis.

tive territories, Mr. Keller continued.

Sales Machinery Considerations

Manufacturers should decide when a machine is obsolete and when parts no longer will be furnished. Parts supplied, however, should reflect a margin of profit above the average, said Mr. Keller. Some members have suggested that Giddings & Lewis Machine Tool Co. and Monarch Machine Tool Co. have the ideal type of price forms.

"Sales machinery must be overhauled and rebuilt," declared Mr. Keller. "Order-takers must be converted into salesmen or taken off payrolls. Sales positions must be filled by practical or graduate engineers. Sales engineers should be able to work with maintenance men in straightening out difficulties."

Sales Engineering as a Career

With the necessity ahead of selling in a highly competitive market, the first objective of the machine tool industry saleswise is to interest the coming generation in the future and in the value of sales engineering as a profession, said H. L. Tigges, chairman, sales and service committee, National Machine Tool Builders' Association, and vice president and sales manager, Baker Brothers, Inc., Toledo, Ohio. Purdue University started a course in sales engineering Feb. 10, and everything will be done to extend such courses to other colleges.

Distributors and builders should not overlook the fact that they often have good youngsters in their engineering and office departments and in their shops suitable to become salesmen, Mr. Tigges reminded. He emphasized the need for creative selling, whereby savings, increased output and improved quality product derived from new equipment purchases are pointed out to customers. He stressed the desire of manufacturers to help train distributors' salesmen, fitting the training at the factory carefully into the entire training program set up by individula distributors.

Machine Tool Show Plans

The Machine Tool Show and Machine Tool Congress were described in detail by Tell Berna, general manager, National Machine Tool Builders' Association; George L. Deane, chairman, association's Machine Tool Show committee; and A. B. Einig, chairman, Machine Tool Congress committee. E. P. Essley, E. L. Essley Machinery Co., Chicago, reported as chairman of overhead expense research committee, while Roy Hall, of Hall, Penny & Jackson Co., Chicago, talked on the value of industry statistics.

E. B. MacDonald, Syracuse Supply Co., Syracuse, N. Y., made a report for the committee on statistics, and Leo H. Gorton, Machine Tool & Supply Co., Tulsa, Okla., reported on regional activities of the association. T. R. Rudel, Rudel Machinery Co., New York City, presented an insigne for the association which was adopted unanimously. It will be used officially for the first time by the association at the Machine Tool Show.

Further Allotment Slash Looms As Copper Stockpile Dwindles

CLEVELAND—Further shaving of copper allotments during the second quarter of this year faces manufacturers, according to confidential reports. Fears of a copper buying "panic" are being voiced, and it is hoped Congress will take steps to remedy the situation.

With virtually no stockpile on hand at present, immediate action is held necessary. One manufacturer said the copper pinch has crippled his production for the past six months. Only part of increased copper cost can be passed on to customers. Aluminum wire is being substituted wherever possible.

Supply of Steel for Automobiles Will Move Higher in 3rd Quarter

PITTSBURGH—The trend of steel deliveries to Detroit-area automobile manufacturers will move higher during the third quarter and possibly in the second quarter. Deliveries, however, will not reach the vast tonnage increase expected in some quarters.

Much depends upon the demands made upon the steel industry for sheets for the railroad freight car builders. The steel companies have voluntarily agreed to supply vast amounts of steel to these builders and the latter cannot build their programmed units without substantial quantities of sheets along with the plates, shapes and other essential parts which go into freight cars.

Sheet Demand Continues

There are guesses being made here that the railroad equipment plants are not going to be able to utilize all the steel that is being promised to them.

There is no letup in the demand for sheets nor is there any decline in the mills' backlogs of these items. But there appears to be more of a resistance on the part of some consumers to payment of "gray market" prices. Such a resistance will be a success only if this attitude brings out more material at quoted levels.

Supply Outlook Improves

Fundamentally, the outlook for a better steel supply—and this includes sheets and some other scarce items —stems from a growing belief that there is going to be a protracted period of steady operations in the steel industry.

There is only one obstacle ahead, the agreement with the steel workers, and the trend of these negotiations shows promise.

First-Quarter Profits Up

A major portion of the first quarter of 1947 is believed to have produced a substantial volume of profits for the steel companies and much of the credit for this showing is being laid to a high rate of production.

Reasonable assurance that this rate of production can be expected in the future is believed to have prompted the leading U. S. Steel unit in Pittsburgh to reduce some of its so-called extras in the price list which had the net effect of reducing prices to customers. A factor in the revision of these extras, too, was inequality evident from experience of the three months they were in effect. The last changes, which were upward, were made last December.

Foreign Report

(BASED UPON REPORTS FROM McGRAW-HILL WORLD NEWS BUREAU)

USSR Designs Piston Plant

MOSCOW — A factory for almost complete automatic manufacture of automobile pistons has been designed and is expected to be under construction this year. The plant will consist of four shops, each of which will contain two automatic machine tool lines. The automatic plant will perform more than 500 operations, and will require a force of only 30 workers. Automatization will be achieved by application of photo-relays, hydraulic controls, and a system of electronic control devices.

Soviet Television Expansion — Application of television in Soviet industry will be greatly expanded this year. Television is now being used in the iron and steel industry for watching the process of smelting pig iron and steel in blast and open-hearth furnaces. Ultraviolet and infrared rays, penetrating the walls of the furnaces and transformed by special appliances, clearly show the smelting process on the television screen. Television enables a single engineer to control the whole process of the production of auto pistons. Considerable funds have been appropriated for the current five-year period to provide Soviet industry with modern television instruments.

Improved Welding Technique — A new method of electric welding which revolutionizes the entire welding process has been announced by Soviet experts. This method, it is claimed, increases the speed of welding from 5 to 10 times as compared with the most advanced methods used at present in the USSR. It permits welding 500 to 650 ft. an hr. under laboratory conditions, reduces the expenditure of electric power, and can be used to fuse heterogeneous metals.

The welding process is divided into two independently controlled phases: fusion of the parts welded and fusion of the addings.

Laboratory research revealed difficulties and defects in ordinary welding is caused by fusion of the parts welded taking place simultaneously with fusion of the addings —the metal which joins the welded parts. It appears most of the voltaic arc energy is utilized for fusing of the parts welded and thus heat is lacking for fusing of the addings. In tests, the voltaic arc was used to fuse only the surface of welded articles. The adding, fused beforehand, is supplied to the place of welding in a liquified state.

The new method is expected to enable rails to be produced from low-carbon steel with wear-resistant surfaces. It may also be applied widely for mass production of cutting tools with added metal edges.

Progress on Russia's Five-Year Plan — A number of departments are already in operation at the Southern Urals Heavy Machinery Works. Shown here is a machine shop, recently completed, which is now turning out equipment for Soviet metallurgical enterprises. Construction of the plant was started during the war in the outskirts of Orsk as one of the major construction jobs of the current five-year plan

Steel Plants for Wales

LONDON—Hot-strip coils weighing 15,000 lb., larger than any at present being rolled in the world, will be turned out at the rate of 20,000 tons a week at the new continuous hot-strip mill at Margam, South Wales. The plant, part of a comprehensive scheme for development of a steel sheet and tinplate industry in South Wales, will use an estimated 46,000 hp. as compared to the 42,900 used by the Irwin Works of U. S. Steel Corp.

In addition to the hot-strip mill, cold-reduction mills will be erected with appropriate tinning facilities. These plants will operate at speeds up to 4,000 ft. per min. The new plants will likely be in production in four years. Certain equipment items will be obtained from the U. S.

German Machine Tool Producers Represented at Leipzig Fair

LEIPZIG — Machine tool manufacturers from all over Germany were represented at the Leipzig Fair. Most of the exhibitors, however, were from the Soviet zone because it is difficult to transport heavy goods from distant points.

Britain and European countries showed great eagerness to place orders for machine tools. Since western zone machine tool manufacturers were not among the exhibitors, it is difficult to tell how soon they can start meeting the growing demand for exports.

It was evident that Soviet zone exhibitors generally were not in a position to fulfill domestic or export orders in less than a year, and frequently in two years. In many instances, they had Russian reparations orders to complete first. All of them are faced with uncertainty as to raw materials. There appeared to be very little in the way of new developments on exhibition.

Only certain manufacturers had the Soviet Administration's permission to accept sales orders, and many were only allowed to note sales prospects with the provision orders would be filled only if conditions permit. Whether Russian zone plants are under state control, owned by the Soviets or privately owned and controlled, they still depend on the Soviet Administration for raw materials allocations down to the last nail and must have all orders approved.

Names in the News

Harry K. Clark

Harry K. Clark, recently elected executive vice president of the Carborundum Co., Niagara Falls, N. Y., has been elected president of the firm. He succeeds **Arthur Batts,** who was named chairman of the board. Prior to the war, Mr. Clark was vice president and general manager of the Norton Co., Worcester, Mass. **Edwin R. Broden,** formerly with Blaw-Knox Co., Pittsburgh, has joined the company as vice president in charge of operations and a member of the board.

J. H. Elliott has been elected president and general manager of the Landis Machine Co., Waynesboro, Pa. He succeeds **C. N. Kirkpatrick,** who has been elected chairman of the board. **R. G. Mumma** has been appointed secretary of the firm.

Alfred J. Yardley, former executive vice president, has been elected president of Jenkins Bros., Bridgeport, Conn. He succeeds his father, **Farnham Yardley,** who has become chairman of the board, after serving as president for 30 years.

P. J. Urquhart, vice president of the Aluminum Co. of America, retired after more than 45 years with the company.

Elmer W. Shepard has been named vice president and treasurer of Graybar Electric Co. On April 9 he completed 41 years of service with the firm.

F. L. Hopkinson has been appointed executive vice president of Graham-Paige Motors Corp., Willow Run, Mich., and of Graham-Paige International Corp. He was formerly vice president and a member of the board of Willys-Overland Motors Co., Toledo, Ohio.

Lee W. Delhi has been appointed vice president and director of California Steel Products Co., Richmond, Calif.

Howard A. Hein, formerly chief sales engineer of the Cleveland Automatic Machine Co., has been appointed manager of the Detroit branch office.

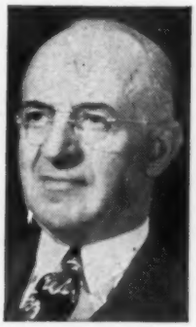
Dr. Melville F. Peters, formerly in charge of research at Titeflex, Inc., Newark, N. J., has been appointed chief engineer of the firm.

John Dykstra has been named general production assistant of the Ford Motor Co.

Dean Hammond has been appointed chief engineer of Kaiser-Frazer Corp., Willow Run, Mich.

John C. Vander Pyl, executive vice president of American Machine & Metal Co., has been elected president of the company. He succeeds **P. G. Mumford,** who continues as chairman. **Charles W. Anderson** was named executive vice president and **P. S. Mumford,** general manager of the East Moline, Ill. factory, was elected a vice president.

G. F. Holland



Henry J. Lucey

George F. Holland has been elected president of Union Twist Drill Co., Athol, Mass. He was formerly manager of the Butterfield Div. of the company, with which he was associated for 25 years.

Henry J. Lucey, sales manager of the oil-extraction division of Detrex Corp., has been placed in charge of export sales for the company.

Kenneth L. Walker has been appointed vice president in charge of production of the Kalamazoo Stove & Furnace Co.

Albert H. Shonkwiler has been named general manager of the Lackawanna plant of Bethlehem Steel Co., succeeding the late **Edward F. Entwisle.**

K. L. Crapeau has been appointed sales manager for the export division of Chrysler Corp., Airtemp Div.

A. J. Pepin, former chief metallurgist of Wyman-Gordon Co., Worcester, Mass., is now assistant to the vice president. He is succeeded as chief metallurgist by **Arnold Rustay.**

D. M. Pattison

Robert A. Neal

Donald M. Pattison, general sales manager of The Warner & Swasey Co., Cleveland, has been elected to the board of directors and named vice president in charge of sales.

Robert A. Neal, vice president of the Westinghouse Electric Corp., has been named general manager of the company's Pacific Coast operations. Mr. Neal has been with Westinghouse for 37 years and was named vice president 3 years ago.

Frederick E. Munschauer, Jr. has been appointed works manager of Niagara Machine and Tool Works, Buffalo, N. Y.

Col. Howard W. Robbins has retired as safety engineer of the Norton Co., Worcester, Mass., after 31 years of service. He has been succeeded by **John Hychka.**

S. W. Brandel, formerly vice president and works manager of the Marlin-Rockwell Corp., Jamestown, N. Y., has been elected president to succeed the late **John H. Walters. L. A. Cummings,** former chief engineer, succeeds Mr. Brandel as vice president and works manager, while **H. A. Johnston** has been elected vice president and sales manager and **Daniel Gurney,** vice president and chief engineer.

C. R. Harmon has been appointed Pittsburgh district sales manager for Firth Sterling Steel & Carbide Corp., McKeesport, Pa.

G. F. Maughmer has been appointed manager of the Los Angeles office of the apparatus department of General Electric Co. He succeeds **S. E. Gates,** who retired after 42 years with G.E.

Ken O. Hood has become Pacific Coast district manager of the Falk Corp., Milwaukee, Wis. With headquarters in Los Angeles.

William S. Lyhne, general manager of the Indianapolis, Ind. division of F. L. Jacobs Co., and **E. A. Ruggles,** general manager of the company's Spring Div. at Danville, Ill., have been elected vice presidents of the company.

BUSINESS ITEMS

The R. K. LeBlond Machine Tool Co., Cincinnati, has opened a direct sales office at 3701 No. Broad St., Philadelphia. The new office is headed by **N. J. Koppi,** who has been associated with LeBlond for the past 22 years. LeBlond has appointed **Farquhar Machinery Co.,** Jacksonville, Fla., as its exclusive distributor for its lathes and cutter grinders in central and northern Fla. Also, the **Henry Walke Co.** of Norfolk, Va., has opened a branch office at 245 Spring St., S. W., Atlanta, to serve as exclusive LeBlond distributors in Ga.

Chrysler Corp., Airtemp Div. has established a new research laboratory at Dayton, Ohio, to provide improved heating, air conditioning and commercial refrigeration equipment.

Barcalo Manufacturing Co., Buffalo, has acquired **Chandler Industries, Inc.,** Buffalo.

The LeMaire Tool & Manufacturing Co., Dearborn, Mich., has acquired the patents and manufacturing rights to the Sundstrand 3-wheel grinder, formerly manufactured by the **Sundstrand Machine Tool Co.,** Rockford, Ill.

Westinghouse Electric Corp. has leased the Sunnyvale, Calif. plant of the **Joshua Hendy Iron Works** for 10 years. In addition to continuing Hendy's production of heavy equipment, Westinghouse will add new products now being manufactured in other Westinghouse plants.

The Hydro-Line Manufacturing Co. has been formed in Rockford, Ill., to manufacture standard and special air and hydraulic cylinders. The plant and offices are located at 711 Nineteenth St., with **G. A. Markuson,** president; **Gust J. Peterson,** vice president, and **H. W. Johnson,** secretary of the firm.

Wheelco Instruments Co., Chicago, has completed arrangements with **Ether, Ltd.,** Birmingham, England, whereby Wheelco instruments will be manufactured and marketed throughout the United Kingdom by Ether. The instruments will be sold under the name of Ether-Wheelco Controls.

Titan Metal Manufacturing Co. has moved its Tulsa, Okla. offices to 1348 So. Indianapolis St. Also, **Paul R. Spencer & Co.,** 4000 York St., Denver, Colo., has been named sales agent for all Titan brass and bronze products in Colo., Mont., Neb., Ariz., N. M. and western Texas.

Rudel Machinery Co., New York City, has been appointed exclusive dealer in the New York and Hartford area for the engine lathes manufactured by **The Boye & Emmes Machine Tool Co.,** Cincinnati.

Borg-Warner Corp. has completed the modern research laboratory and the installation of machine tools in its **Pesco Products Div.,** Cleveland.

The American Brake Shoe Co. has opened a sales office at 1500 Walnut St., Philadelphia, Pa., and is occupied jointly by representatives of four divisions of the company: **James J. Nelson** of the National Bearing Div., **Thomas N. Mitchell,** district manager, the Kellogg Div.; **L. John Harwood** of the Electro-Alloys Div., and **George E. Anne** from the Brake Shoe & Castings Div.

Lord Manufacturing Co. has established a new field office in Providence, R. I. in the Industrial Trust Bldg., with **Dan Rowan** in charge.

Ladish Co., Cudahy, Wis., has established a new district office in Atlanta, Ga., and discontinued the one in New Orleans. The new office, which will serve the southeastern area, is at 452 Spring St., N. W., with **W. W. Bowie** in charge.

Alloy Rods Co., York, Pa., has appointed **The Rodgers Welding Supply Co.,** 1527 Main St., Buffalo, as its distributor in that area to handle its complete line of electrodes.

OBITUARIES

Arthur G. Green

Arthur G. Green, 51, sales manager for the Bay State Abrasive Products Co., Westboro, Mass., passed away March 6. He joined Bay State Abrasive Products Co. in 1944 as sales manager after a 27-year association with the Norton Co., Worcester, Mass. Mr. Green was also a member of the American Society of Tool Engineers.

James L. Linsley, 66, director and retired secretary of the Eastern Malleable Iron Co., Naugatuck, Conn., died March 5.

Jack Wilson, manager of the Seattle, Wash., branch of John A. Roebling's Sons, passed away March 6. He had been with the firm for 27 years.

Earl H. Wheeler, 56, widely known mechanical engineer and screw expert, died suddenly March 4. Mr. Wheeler was formerly associated with the old Gridley Machine Co., Windsor, Vt., and more recently was an officer of the New Britain Gridley Machine Co. At the time of his death, he was a partner in the Poly Choke Machine Co., Tariffville Conn.

Edward F. Entwisle, general manager of the Lackawanna plant of the Bethlehem Steel Co. for the past 5 years, passed away March 8.

MEETINGS

American Gear Manufacturers Association. 31st annual meeting. The Homestead, Hot Springs, Va. June 2-4. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

American Iron & Steel Institute. General meeting. Hotel Pierre, May 21. Waldorf-Astoria Hotel, May 22. New York, N. Y. George S. Rose, Secretary, 350 Fifth Ave., New York, N. Y.

American Management Association. Production meeting. Hotel Pennsylvania, New York, N. Y. April 14-15. General management meeting. Hotel Pennsylvania, New York, N. Y. June 11-12. Edward K. Moss, director of Public Relations, 330 W. 42 St., New York 18, N. Y.

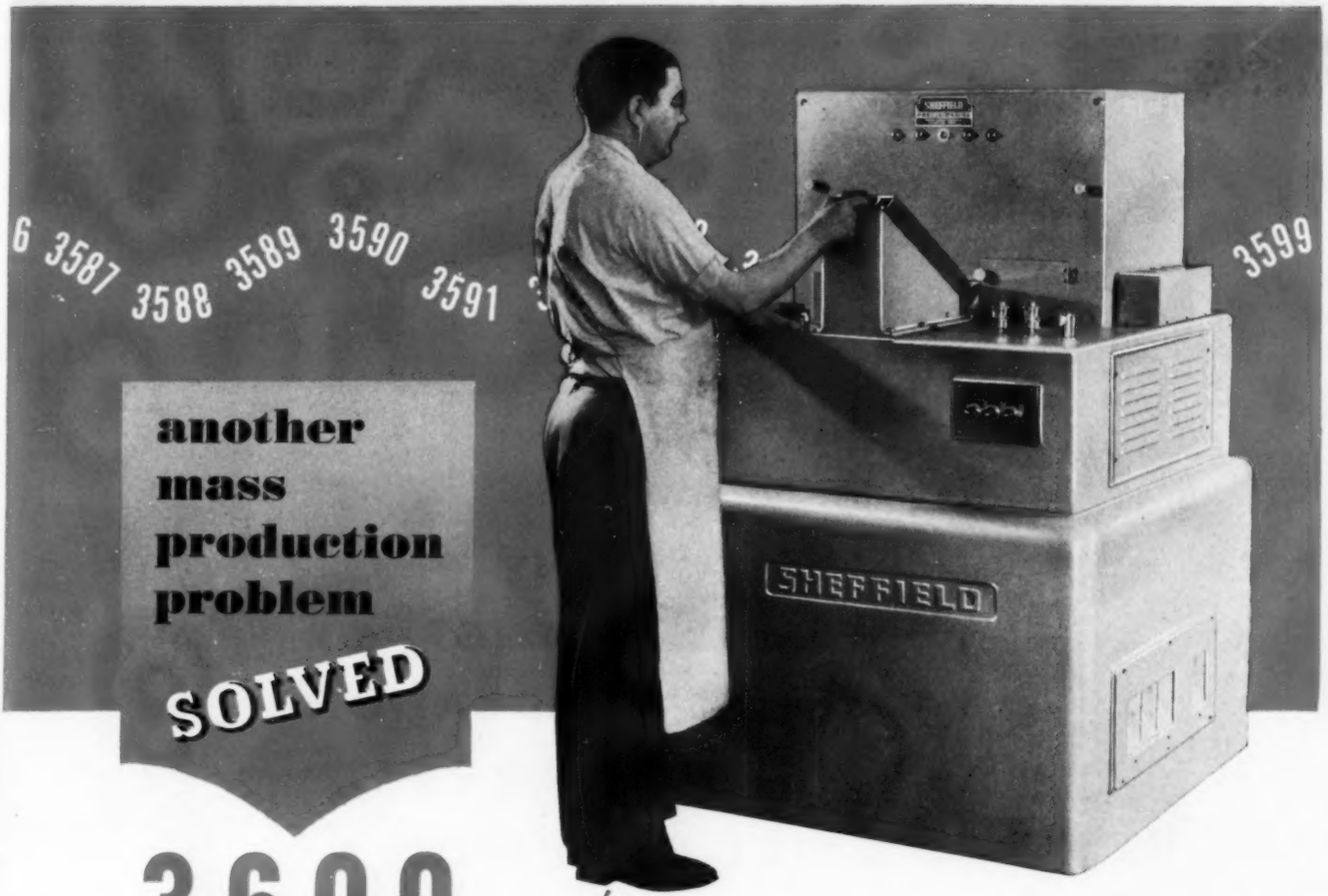
American Society for Quality Control. Annual convention and Midwest Quality Control Conference. Hotel Sherman, Chicago, Ill. June 5-6. Edward D. Thompson, general chairman, P. O. Box 1097, Chicago 90, Ill.

Metal Powder Association. Annual spring meeting. Waldorf-Astoria Hotel. New York, N. Y. May 27. Association Headquarters, 420 Lexington Ave., New York, N. Y.

Society of Automotive Engineers. Transportation meeting. Hotel Stevens, Chicago, Ill. April 16-18. Summer meeting. French Lick Springs Hotel, French Lick, Ind. June 1-6. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

Society of the Plastics Industry, Inc., National Plastics Exposition. The Coliseum. Chicago, Ill. May 6-10. Wesley S. Thurston, director of public relations, 330 W. 42 St., New New York, N. Y.

Southern Machinery & Metals Exposition. 2nd annual exposition. Municipal Auditorium, Atlanta, Ga. April 14-17. R. S. Lynch, president, Atlantic Steel Co., Atlanta, Ga.



another mass production problem SOLVED

3600 *pistons classified per hour*

Shock absorber pistons come by conveyor from the centerless grinders to this Sheffield "Airlectric" Automatic Gaging Machine for inspection and dimensional classification.

The operator merely feeds the pistons into a chute. The "Airlectric" then automatically segregates undersize and oversize units. At the same time, those which fall within tolerance limits are separated into five classifications for subsequent selective assembly—and at the rate of 3600 units per hour.

If you require accurate inspection on large volume production, you can make material savings with machines similar to that described here. *Chek with Sheffield* on multiple and automatic gaging problems.

the *Sheffield* corporation

Dayton 1, Ohio U. S. A.

Standard Gages Shipped in 24 Hours

Sheffield MASTER CRAFTSMEN

2580

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HACKSAWS • BAND SAWS FOR CUTTING METAL, WOOD, PLASTICS

Surface Roughness, Waviness and Lay—I*

American Standard B.46.1—1947. Sponsored by SAE and ASME. Approved by ASA, Feb., 1947.

THIS STANDARD is concerned with the geometrical irregularities of surfaces of solid materials. It establishes definite classifications for various degrees of roughness and waviness, and for various varieties of lay. It deals only with their height, width, and direction.

Definitions

Surface. The surface of an object is the boundary which separates that object from another substance. Its shape and extent are usually defined by a drawing or descriptive spec.

Profile. The contour of any specified section through a surface.

Roughness. Relatively finely spaced surface irregularities. On surfaces produced by machining and abrasive operations, the irregularities produced by the cutting action of tool edges and abrasive grains, and by the feed of the machine tool are roughness. Roughness may be considered as being superposed on a "wavy" surface.

Waviness. The surface irregularities which are of greater spacing than the roughness. On machined surfaces such irregularities may result from deflections, vibrations, warping, strains, or other causes.

Flaws. Irregularities which occur at one place, or at relatively infrequent intervals in the surface, e.g. a scratch, ridge, hole, peak, crack, or check.

Lay. The direction of the predominant surface pattern.

Microinch. One millionth of an inch. (0.000001 in.)

Roughness Width Rating. The maximum permissible width of repetitive units of the dominant surface pattern. It may be specified in inches adjacent to the lay symbol. Irregularities having widths up to and including the maximum specified, or when no dimension is specified, up to and including the width of the irregularities due to machine feed shall be the basis for the roughness height specification.

Waviness Width Rating. Waviness widths may be specified in inches.

Height Rating. The height of the roughness or waviness shall be specified in one of the following terms:

Maximum Peak to Valley Height
Average Peak to Valley Height
Average (Either Root Mean Square of Arithmetical) Deviation from the Mean Surface

* *"Surface Roughness Blocks," Part II of the above title, is in preparation by the engineering societies.*

Note: A general note should be included in all specifications and drawings indicating which type of height rating is intended.

Lay Specification. The lay of a surface shall be specified by the lay symbol indicating direction of the visible surface marks.

For compliance with specified ratings, surfaces may be evaluated by:

(a) Comparison with specified reference surfaces or observational standards
(b) Direct instrument measurements

In many applications these comparisons can be made by sight, feel, or instrument. In making comparisons, care should be exercised to avoid errors due to differences in material, contour, and type of operation represented by reference surface and work.

In using instruments for comparison, or for direct measurement, care should be exercised to insure that the specified quality or characteristic of the surface is measured.

Roughness measurements, unless otherwise specified, are taken across the lay of the surface, or in the direction which gives the maximum value of the reading.

Recommended Values

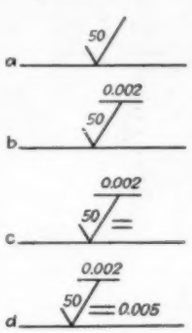
The use of only one number to specify the height or width of irregularities shall indicate the maximum value. Any lesser degree shall be satisfactory. When two numbers are used, they shall specify the maximum and minimum permissible values.

ROUGHNESS HEIGHT VALUES (MICROINCHES)				
¼	5	20	80	320
½	6	25	100	400
1	8	32	125	500
2	10	40	160	600
3	13	50	200	800
4	16	63	250	1000

WAVINESS HEIGHT VALUES (INCHES)					
0.00002	0.00008	0.0003	0.001	0.005	0.015
0.00003	0.0001	0.0005	0.002	0.008	0.020
0.00005	0.0002	0.0008	0.003	0.010	

Surface Symbol

The symbol used to designate surface irregularities is the check mark, and an horizontal extension as shown.



Roughness height value is placed adjacent to and on the inside of the long leg as shown.

Waviness height value, when required, is placed, above the horizontal extension line as shown.

Lay designation, when required, is indicated by the lay symbol, placed under the extension to the right of the long leg line as shown.

Roughness width value, when required, is placed to the right of the lay symbol as shown.

The point of the symbol may be on the line indicating the surface, on the witness line, or on an arrow pointing to the surface. The long leg and extension shall preferably be to the right, as the drawing is read.

Symbols Indicating Direction of Lay

= Parallel to the boundary line of the surface indicated by the symbol.

⊥ Perpendicular to the boundary line of the surface indicated by the symbol.

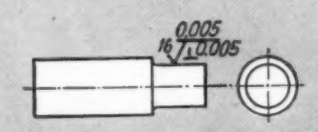
X Angular in both directions to the boundary line of the surface indicated by the symbol.

M Multi-directional.

C Approximately circular relative to the center of the surface indicated by the symbol.

R Approximately radial relative to the center of the surface indicated by the symbol.

=.005 The numerical value in inches of the width of spacing of roughness is added to the right of the directional indication of the lay symbol as shown.



An example would be the use of the symbol to express this specification:
Roughness height = 16 microinches
Waviness height = 0.0005
Lay = Circumferential
Roughness Width = 0.030 in.

Fig. 1—Specimen Application

Fig. 2—Meaning of Each Part of Symbol Defined

Cost Reduction thru faster machining

Throughout the metalworking field there are many parts that can be surface broached at remarkable savings over the costs of the present machining method. The aircraft, automotive, small tool, appliance and even sporting goods manufacturers have all found ways of making parts faster, cheaper and to finer tolerances through the use of Footburt Surface Broaching Machines. We will be glad to work with you on the application of surface broaching.

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Pointers for Plastic-Mold Makers—I

COURTESY, CHEMICAL DIVISION, GENERAL ELECTRIC COMPANY

CERTAIN definite limits are characteristic of design in plastics and knowledge of these is necessary to both the product designer and the designer of tools and molds.

General

1. Machining of the finished part should be held to a minimum for better resistance. However, drilling, tapping, grinding and machining of undercuts are justified.

2. Avoid using a radius at the cut-off corner.

3. If large production is anticipated, or if the plastic part is complicated, an accurate model should be made to check appearance, functional dimensions and clearances.

Ribs, Bosses and Fillets

1. Ribs provide strength, facilitate material flow and may be used on one or both surfaces or to flow material to isolated bosses or projections.

2. Ribs should have ample section and sufficient draft or taper (at least 5°) and generous radii at top and base.

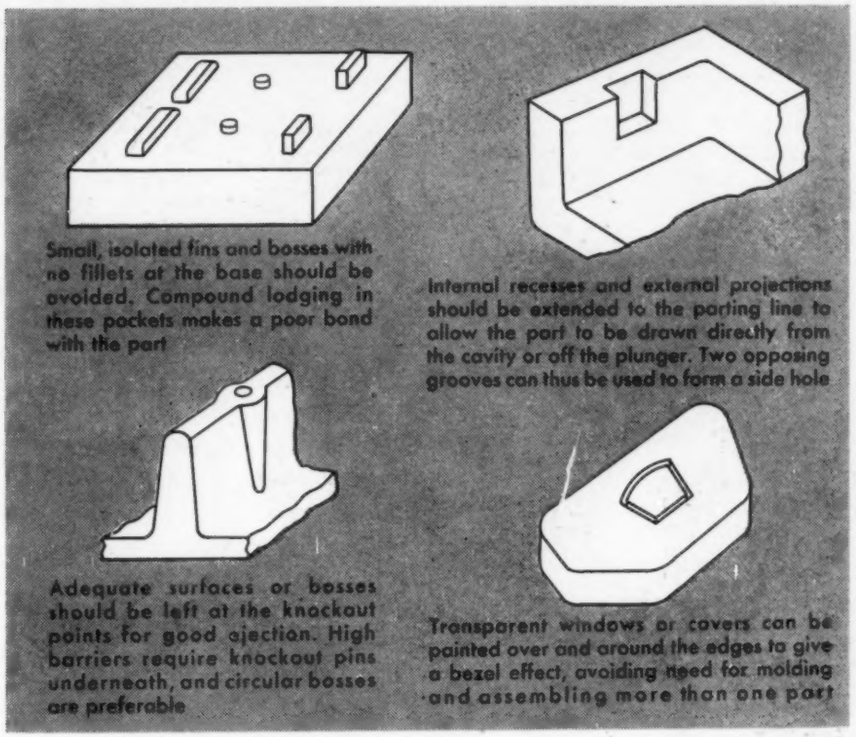
3. Large otherwise unsupported surfaces should be designed with ribs to provide mechanical strength and reduce warpage.

4. Bosses, for mounting or assembly should be located in corners if possible.

5. If four bosses are used for mounting, their top surfaces should be ground flat; three bosses are preferable and will eliminate this operation.

6. For small bosses the height should not be more than twice the diameter.

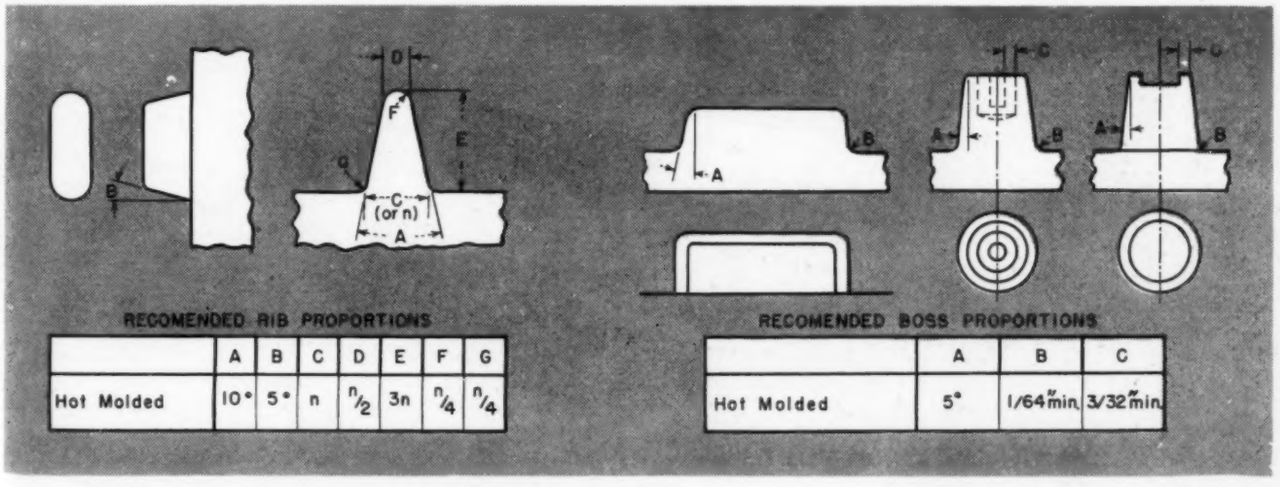
7. High bosses tend to trap gas,


Small, isolated fins and bosses with no fillets at the base should be avoided. Compound lodging in these pockets makes a poor bond with the part
Internal recesses and external projections should be extended to the parting line to allow the part to be drawn directly from the cavity or off the plunger. Two opposing grooves can thus be used to form a side hole
Adequate surfaces or bosses should be left at the knockout points for good ejection. High barriers require knockout pins underneath, and circular bosses are preferable
Transparent windows or covers can be painted over and around the edges to give a bezel effect, avoiding need for molding and assembling more than one part

COMPARATIVE AGING CHANGES*

Phenolic—heat-resisting type	1
Phenolic—low loss	2
Polystyrene	3
Phenolic—general-purpose type	4
Phenolic—acid and alkali	5
Phenolic—impact resistant type	6
Ureas	7
Cellulose acetate, cellulose acetate butyrate	8

** Dimensional*



RECOMENDED RIB PROPORTIONS

	A	B	C	D	E	F	G
Hot Molded	10°	5°	n	n/2	3n	n/4	n/4

RECOMENDED BOSS PROPORTIONS

	A	B	C
Hot Molded	5°	1/64" min.	3/32" min.

Need special shapes?

If you use bars or wire in your products, there's a good chance you can save time and save steel with standard or special shapes of ARMCO Stainless Steels.

The various special shapes indicated on this page have given many manufacturers three big advantages.

1. **Less steel lost in machining**
2. **Fewer fabricating operations**
3. **Higher production**

Besides these special shapes, Armco's Rustless Division offers you a selection of more than 60 standard and special grades of stainless steel bars and wire. There are grades for practically every requirement — for utmost corrosion resistance, strength at high temperatures, and for durability in rugged service conditions.

Whether your problem is one of engineering or manufacturing, Armco engineers will be glad to supply you with information about stainless steel bars and wire for your products. Best of all, we can offer you quick deliveries of many shapes and sizes.

For specific information just fill in the coupon below and mail it today. Address the Rustless Division, The American Rolling Mill Company, 3415 E. Chase St., Baltimore 13, Md.

Have you turned in ALL your Steel Scrap? It's Needed — Critically!

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Baltimore 13, Md.

Can you supply a bar shape like this: Size:

Delivery Needed:

Purpose Company

Name City

Street State

Rustless

ARMCO

DIVISION OF

Pointers for Plastic-Mold Makers—II

decrease density and strength of molded part and make mold machining unduly difficult.

8. Mounting bosses should project at least 1/64 in. beyond other projections on the molded part.

9. Fillets or radii at base of ribs and bosses facilitate flow of compound and eliminate sharp corners.

10. Shadows or flow lines on outer surfaces may be reduced by inside fillets, which also eliminate dust traps.

11. All corners should have at least a 1/32 in. fillet.

Inserts

Good practice calls for inserts whose imbedded length is twice their diameter but size of insert, type of mold, compound and support permit greater slenderness ratio.

1. Delicate inserts should not be used in compression type molds.

2. Minimum thickness of plastics around an insert should be 3/32 in. for a ¼-in insert, ⅛ in. for a ½-in. insert and ¼ in. for inserts over ½ in.

3. Round or simple inserts are more easily cleaned after molding.

4. Inserts which have been knurled, punched or grooved give better anchorage.

5. Inserts should be placed at right angles to parting lines.

6. Sufficient clearance should, when parts are used in electrical contacts, be provided at points of arcing to prevent burning of the plastic.

7. The insert should carry the stress in heavy service loads.

8. Inserts made of porcelain, woven wire mesh, laminated phenolics, woven glass can be molded in plastics.

Assembly

1. Speed clips, stop nuts, spring hinges and self-tapping screws have been especially developed for plastics assembly.

2. Flock-filled materials give the strongest molded threads. Tapping threads in rag-filled plastics may result in weak or incomplete threads.

3. Mold cost is increased and construction made difficult when slots or undercuts for hinges and clips are specified.

4. Adhesives provide good assembly media for thermoplastics but are not effective with thermosetting parts.

5. Inserts with male or female threads in molded parts provide a positive means of assembly.

6. Metal parts may be fastened to rivet-type inserts in molded parts by spinning down the rivet head. Tapping the center of the rivet provides screw attachments for electrical contacts. Tubular rivets may also be inserted in molded holes after molding.

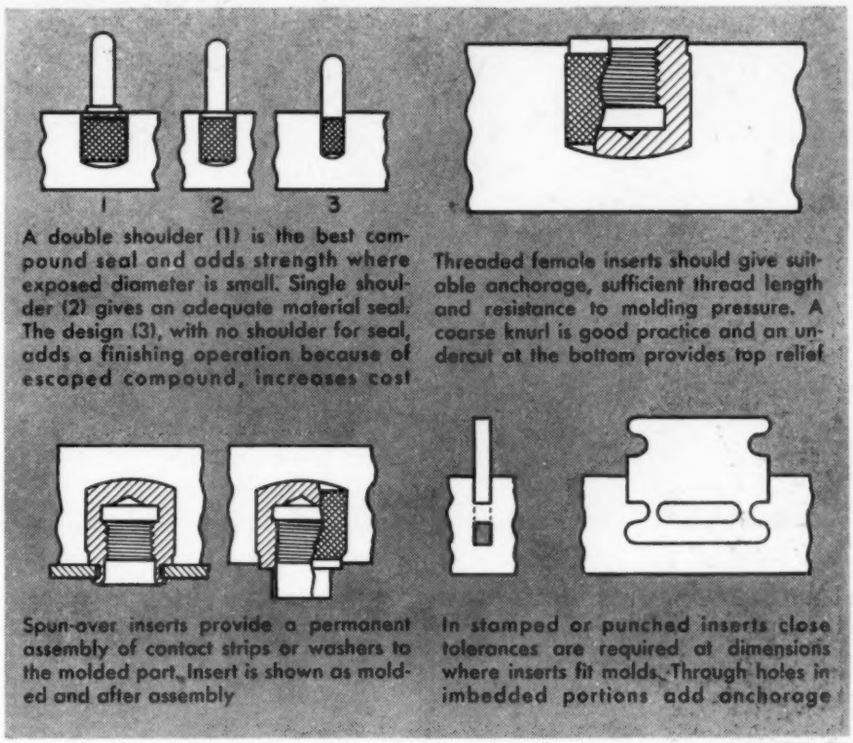
7. In using self-tapping screws the hole is usually molded and length of screw should be over 3/16 in. Blind holes should have at least 1° taper.

8. Holes are drilled for drive screws; minimum flute size should be 1/16 in. to a maximum of 5/16 in.

9. Metal studs may be molded as inserts and fastened with nuts. Loads should be carried between the nut and a shoulder on the stud, not between the nut and the plastic. Lugs of thermoplastics can be sealed and riveted by heat and pressure subsequent to molding.

10. Two or more plastic parts may be assembled with molded threads, but threads of long engagement for plastics-to-metal contact must be tapped after molding because shrinkage of the material shortens the pitch of the molded thread.

11. Metal hinges may be fastened to plastics with screws, and hinges may be molded as an integral part of the plastics piece with retaining slots in the corresponding piece.

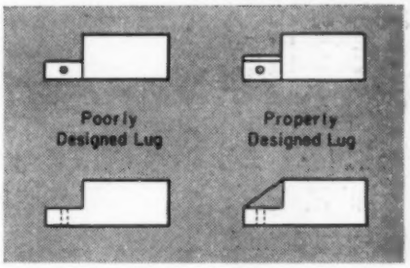


A double shoulder (1) is the best compound seal and adds strength where exposed diameter is small. Single shoulder (2) gives an adequate material seal. The design (3), with no shoulder for seal, adds a finishing operation because of escaped compound, increases cost

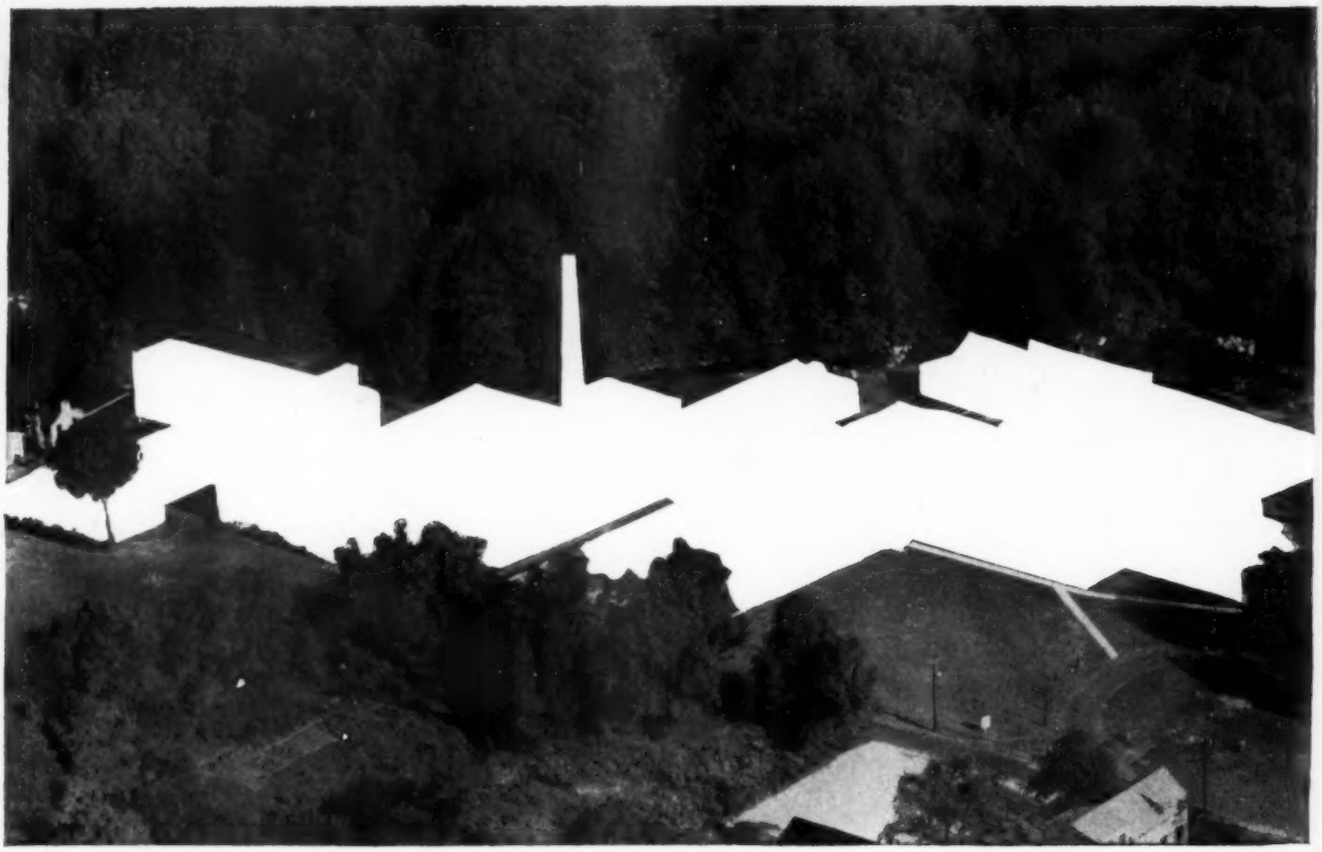
Threaded female inserts should give suitable anchorage, sufficient thread length and resistance to molding pressure. A coarse knurl is good practice and an undercut at the bottom provides top relief

Spun-over inserts provide a permanent assembly of contact strips or washers to the molded part. Insert is shown as molded and after assembly

In stamped or punched inserts close tolerances are required at dimensions where inserts fit molds. Through holes in imbedded portions add anchorage



Thermoplastic materials may be sealed over a lug or rim by hot forming inserts with male or female threads incorporated in molded parts

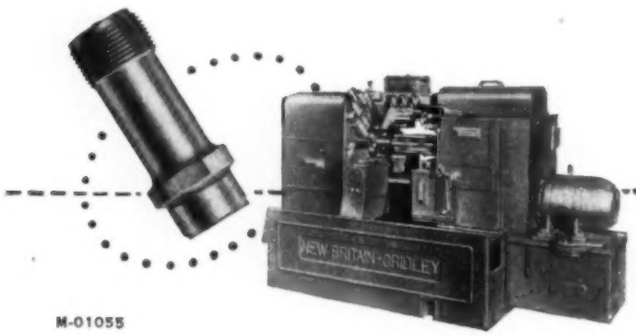


THE PLANT NOBODY HAS EVER SEEN

INDUSTRIAL engineers, labor leaders, management men agree that there never yet has been a manufacturing plant in America that has achieved its absolute maximum of production. Suppose one did exist in which management provided every possible facility, employees used them to the utmost, and management in turn regularly devoted a substantial share of the plant's earnings to invest in more and more efficient machines and methods. Certainly high wages and good returns on stock owners' investments would be no problem to such a business.

Perhaps the absolute ideal plant will never exist, but the tools exist *right now* to enable almost any manufacturer and his employees to achieve spectacular improvements for their mutual welfare. Such an opportunity lies in management's providing the finest, modern production machinery and the latest production methods. In employees' using such machines for all they are worth. Read below how one manufacturer is taking advantage of this opportunity.

EXAMPLE: The aircraft part shown below, is typical of swift, economical, accurate automatic screw machine performance. Speed is maintained by breaking down the inside boring and reaming into four operations. A total of eleven tools work on this piece which is threaded and cut off in the last position, and close limits of concentricity must be maintained between threads and bore. Regular day by day production: 312 pieces per hour.



M-01055

New Britain
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

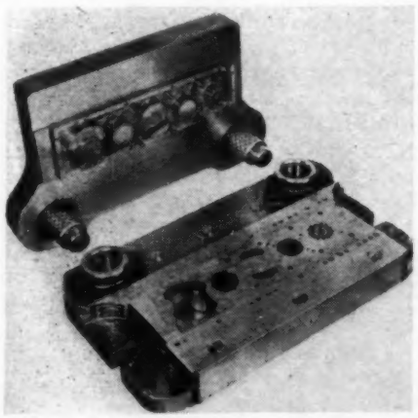
Parts and Materials

Drilling, Tapping of Carbide Parts Made Possible by Carboloy Process

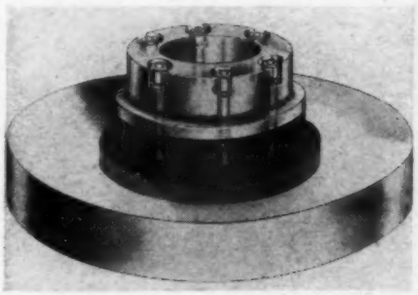
Carbide parts may now be mounted or attached with screws, bolts, studs or other fastening devices in the same manner as parts made of softer metals. The development has been announced by Carboloy Co., Inc., Box 237, Roosevelt Park Annex, Detroit 32, Mich. It entails a process by which machinable materials are solidly imbedded in carbide parts wherever the parts are to be drilled or tapped.

When it is desired to attach carbide parts, the points of attachment are first located. The part is then provided with "inserts" which may be machined at the factory or by the user. Tests are said to have demonstrated that screws, bolts or studs will fail in tension before pulling out the "inserts" or injuring the threads.

Fields opened up by the development include applications where large carbide sections are to be used. "Wear parts" may be rigidly bolted and yet present an unbroken surface, because tapped blind holes may be used in the attaching side of the carbide. Other applications include crank guides, cams, liners for molds and mills, punches, machine ways, work rests and shoes, and precision-instrument wear plates.



Light-tone spots show points of mechanical attachment of 1st three female die members and 1st- and 3rd-stage punches of this 5-stage progressive die



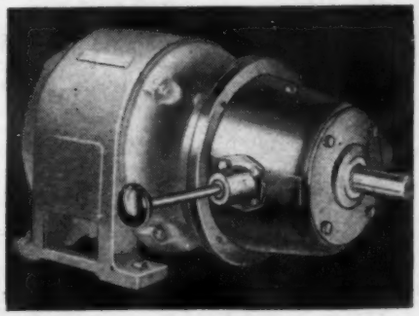
Attachment by studs provides a solid-steel seat and increased impact resistance for the punch of this punch-and-die set

The development reduces the cost of attaching large or small carbide parts or in building up complex dies (such as progressive dies) or other parts composed of small individual units held together and fastened down. Parts as small as 5/16-in. O.D. and ⅜ in. thick (such as replaceable solid-carbide punch ends) can be mounted.

Enthone S-45 Enamel Stripper Leaves No Residue on Surface

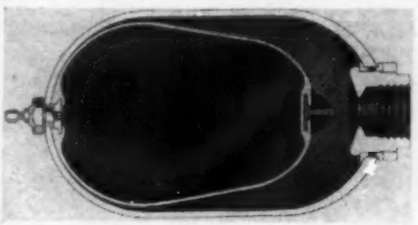
Enamel Stripper S-45 for removal of synthetic enamel and other coatings is available from Enthone, Inc., Dept., AM, 442 Elm St., New Haven, Conn.

The stripper is applied by brush, spray or dip. It is recommended for large parts that cannot be immersed in a stripping solution. A non-waxy evaporating retardent keeps the agent on the work until the wrinkling action takes place and the enamel can be brushed, wiped or scraped off. No residue is left to prevent subsequent adhesion of other finishes.



MOTOR TRANSMISSION—Two-speed motor transmission is announced by Western Mfg. Co., 3400 Scotten Ave., Detroit 10, Mich. Direct motor speed, neutral point, and any reduction up to 6.25:1 are obtained by an automotive-type gearshift lever. Standard reductions are 1½:1, 2:1, 3:1 and 4:1

Greer Hydraulic Accumulator Operates at High Pressures

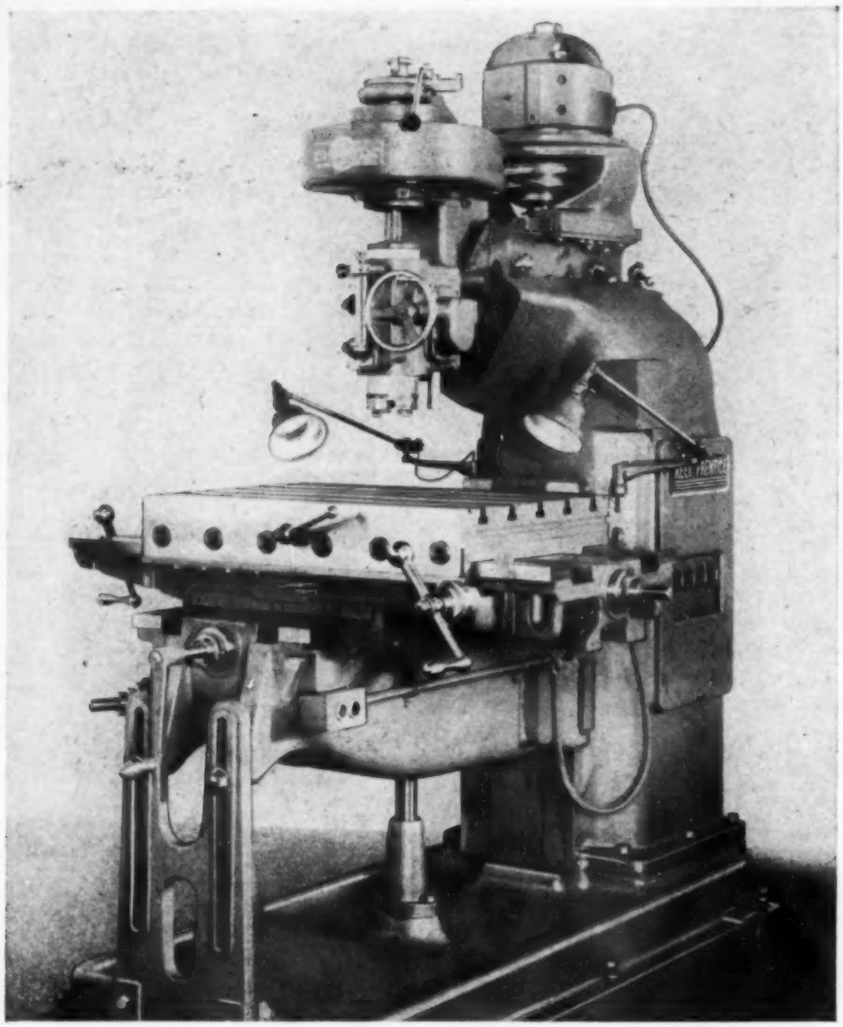


A full-flow hydraulic accumulator has been developed by Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y. Volumetric efficiency is said to be as high as 97% with unrestricted flow up to 50 gpm. and no appreciable pressure drops in systems at pressures as high as 3000 psi.

The one-piece, seamless-steel shell encloses an air bladder made of special natural or synthetic rubber, depending on the fluid in the system. The bladder has a high-pressure automotive-type air valve on one end for preloading with air pressure, and a conical-shaped metal plug on the other end to seal the shell at the end of the oil-discharge cycle. The metal plug eliminates direct contact between the bladder and the outlet plug and thus prevents failure due to "pick-out" of the bag.

Shop Equipment News

Reed-Prentice's Milling Machine Does Milling, Routing, Die-Sinking



The head of this vertical milling machine is mounted on an adjustable ram for wider range forward and back. The ram has 16-in. adjustment

A vertical milling machine has been developed by Reed-Prentice Corp., Worcester 4, Mass. Suitable for high-speed milling, routing and die-sinking work, the wide range of the machine makes possible the handling of die-casting dies, forge dies and tire molds.

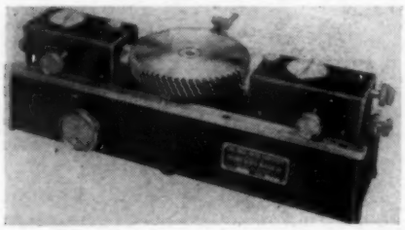
The head and a 3-hp. 1200-rpm. 50/60-cycle motor are mounted on the horizontal ram. Ten spindle speeds from 400 to 2600 rpm. are available with open belt, and five speeds from 133 to 320 rpm. with the backgears. Direct drive from motor to spindle is by V-belt, using 4-step pulleys.

The head is bolted to the ram to provide minimum overhang and firm support for the spindle. The spindle is supported at top by ball bearings and at bottom by double-row roller bearings. The rigidity of head and spindle construction permits use of large-diameter or two-lip cutters. Maximum distance from the spindle to the table is 20 in., while vertical travel of the spindle is 5 in. The taper hole in the spindle is NMTBA No. 40.

The table is 32x22 in., and throat depth is 30 in. Longitudinal feed of the machine is 27 in., while there are 20-in. crossfeed and 16-in. vertical adjustment of the knee.

Attachments including power-feed, motor-driven pump and piping, and hand, or power-feed rotary table are available.

Orlandi Gear-Checking Machine Handles All Types of Gears



A gear-checking machine which checks all types of gears with pins and balls has been developed by Orlandi Gear and Machine Co., 16215 Meyers Rd., Detroit 27, Mich. Visual checking is performed as fast as the operator can lift one gear and replace it on the anvil or locating pin with another. Two machines are available: Model 100-Standard and Model 101-Special.

By using pins or balls, the pitch diameter, concentricity, or the diameter of the gear blank can be checked. Ball or pin retainers are self-aligning, and balls are held in alignment with each other.

The Model 101, which is illustrated, performs checking of tooth spacing, backlash and parallelism in addition to performing the other operations.

Pitch diameter of threads can be measured by three-wire systems by converting the Orlandi. It can also be converted to use as a comparator for checking precision parts.

TURN TO THE FUTURE...

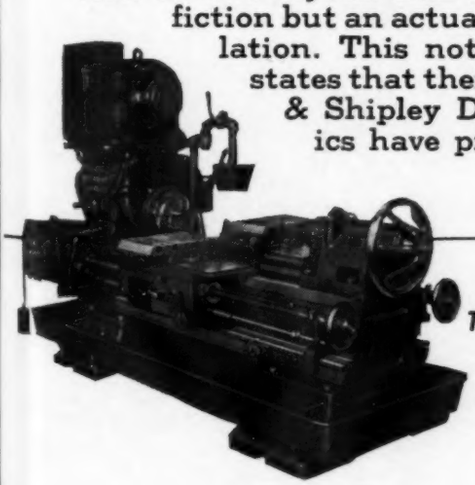
with Lodge & Shipley Lathes

Lodge & Shipley Engineers think beyond present day needs . . . constantly look to the future with design features which offer the widest possible uses . . . produce the greatest possible profits.

That Lodge & Shipley *Engineering Foresight* pays off is demonstrated by reports of users. The view in the crystal ball is not a fiction but an actual installation. This noted firm states that their Lodge & Shipley Duomatics have produced a 250% increase in production of transmission mainshafts. Results that prove it pays to turn to the future . . . with Lodge & Shipley Lathes.

Owners of Lodge and Shipley Lathes are gaining competitive advantages with new lathe equipment capable of "outrunning" soaring costs.

How do your present lathes "stack up" when you consider the future? Call in a Lodge & Shipley Engineer for a comprehensive study of your lathe requirements. Write for Bulletins 634 and 635.



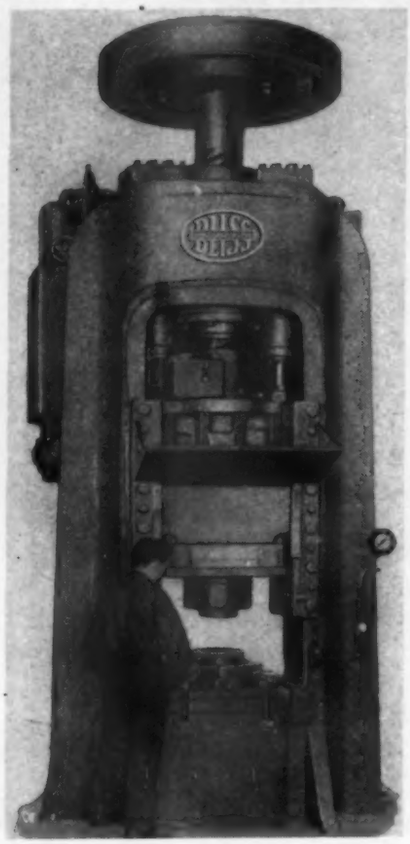
THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3055 COLERAIN

SPECIAL PRODUCTS DIVISION • 800 EVANS ST.

Bliss 600-Ton Hydro-Screw Press Adjusts Power with Variable Pumps



At top position, valves lock the hydraulic pressure of this press and prevent the gate or slide from drifting down between strokes

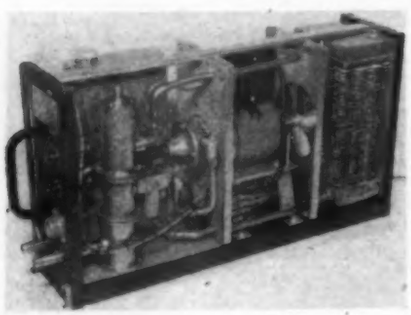
The 600-ton Hydro-Screw press, developed by E. W. Bliss Co., Detroit 2, Mich., uses hydraulic pressure for moving the slide. It makes possible rapid production of hot forgings of steel, brass and aluminum in a wide range of shapes.

A flywheel at the top of the screw is brought to speed by hydraulic pressure. It utilizes accumulated energy to deliver a quick, uniform blow. On a 16-in. stroke under maximum power, the cycle from start to return is accomplished within 3 sec.

Power is adjusted by regulating variable delivery pumps and a pump in the slide provides constant lubrication to the screw. During die setting, the slide can be brought up or down in small increments by means of a pushbutton control with selector switch. An air-operated lift-out in the bed and a similar knock-out in the slide are controlled by limit switches operated by the movement of the slide.

The slide is 25 in. deep and 27 in. wide, and the bed area is 26 in. deep and 29 in. wide. A 40-hp. 1200-rpm. motor and two Vickers PV-2050 pumps are furnished. The screw has 11-in. dia., 12-in. lead and a 4-thread screw. Flywheel speed is 115 rpm. with K.E. of 21,000 ft.-lb. The press comes in 400-, 600- and 1000-ton capacity.

Eastern Heat-Transfer Unit Will Dissipate up to 1000 W.



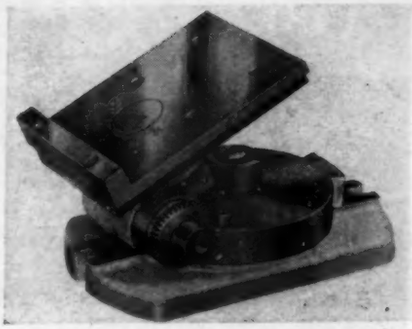
The Model No. 1 heat-transfer unit has been announced by New Haven Div., Eastern Industries, Inc., New Haven 6, Mass. It has many applications including use with induction-heating units and laboratory testing apparatus.

The unit will dissipate up to 1000 w. depending upon operating-temperature range. It is equipped with a four-bank radiator, cooling fan, circulating pump, reservoir, flow switch, thermostat and necessary fittings. The motor is a 1/40-hp., 3450 rpm. 110-v. ac type. Over-all size of the unit is 19⅝x5¼x10½ in., and weight is 40 lb.

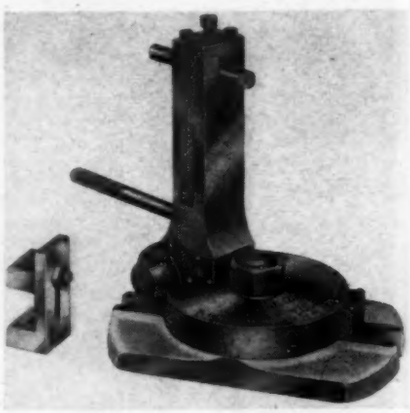
Three Matco Tool Co. Devices Dress or Hold Precision Work

An angle plate, a form dresser and a universal drill jig are manufactured by Matco Tool Co., Div. Machinists Tool Co., 2830-36 W. Lake St., Chicago 12, Ill.

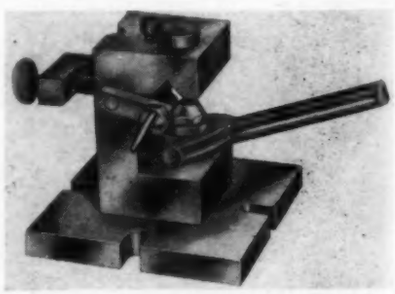
The angle plate is a universal tool for drilling, grinding, gaging and tool-and-die work. The fixture is 3⅜ in. high and has a 3½x4½-in. angle plate. By sliding a diamond holder along the plate ways, the tool can be used to dress angles on grinding wheels.



The form dresser is designed to dress precision radii on grinding wheels. It handles any form of radius dressing, concave or convex, up to 1 in. circle, and dresses up to 10-in. O.D. wheels. With the column tilted, the maximum radius is greatly increased, and special column lengths are available for internal dressing.



The universal drill jig is mounted on a 4x4½-in. removable base and stands 3⅞-in. high. By using the thumbscrew as a positive stop and the adjustable ground anvil for a locating base, holes up to 5/16-in. dia. can be drilled and duplicated in stock up to ¾-in. O.D. The cam-action handle is used for quick locking. Material up to 1-in. dia. can be accommodated on the opposite V-groove.



The jig can also be adapted to other uses. If the base is removed and the fixture is laid on the flat side, the back V-block can be used as a grinding fixture.

GEAR HIGHLIGHTS

VOL. XI NO. 2

This is page 1 of the current issue. Write for the complete issue today.

ALSO IN THIS ISSUE

How to Get Extra Tool Life Free ..... p. 4
New Literature Available.. p. 4
New Minnesota Representative ..... p. 4

STANDARDIZED CONE-DRIVE SPEED REDUCERS NOW AVAILABLE

A complete standardized line of speed reducers, built around double enveloping Cone-Drive gearing is now in quantity production at the Cone-Drive plant of Michigan Tool Company in models to suit practically every requirement. The horsepower and torque these units will transmit for a given size is quite startling to anyone not familiar with Cone-Drive gearing.

The new standardized line includes models with pinion under, pinion over, and with gear shaft vertical. The center distances of from 2 to 18 inches cover a power-transmission range equivalent to 3″ to 24″ center distance in worm

(Continued on page 3)

UNDERPASS CURVE-SHAVING *Features* WISCONSIN AXLE'S PRODUCTION OF LARGE GEARS TO HIGH PRECISION

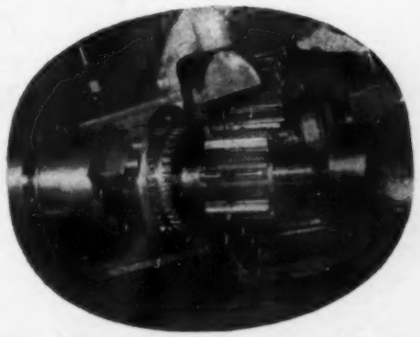
by PERRY L. ADAMS, Gear Superintendent
Wisconsin Axle Division—Timken-Detroit Axle Co.

Since the introduction of shaving into the gear manufacturing cycle, including the curve-shaving of pinions—and particularly since the Underpass method of shaving has been adopted, Wisconsin Axle Division of Timken-Detroit Axle Company, Oshkosh, Wisconsin, has not only been able to reduce manufacturing time and costs but has also been able to improve gear quality. Among the benefits reported are:

1. Less variation in involute form
2. More accurate tooth spacing
3. Correction of lead errors
4. More desirable mating contact between gears
5. Production output increase

These improvements result in corresponding improvements in the service life and quietness of the heavy duty gears which Wis-

(Continued on page 2)



MICHIGAN "SINE-LINE" LEAD — COMPARATORS —

Known as models 1200 and 1200A, virtually foolproof Michigan lead comparators are available for use on the production floor alongside gear cutting and shaving machines. The master multiple thread lead, followers, indicators and actuating mechanisms are all enclosed.

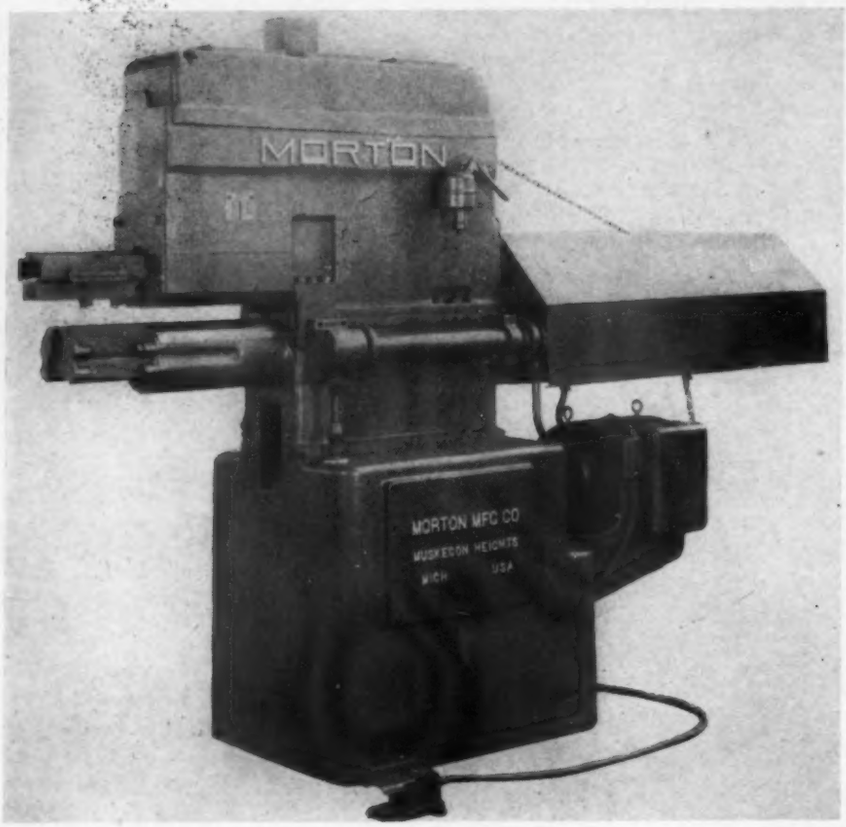
Machines may be used as an aid in setting up gear cutting and finishing machines, to check gears after processing, to determine lead compensation for "unwinding" of gears during heat-treat, etc.

They are applicable to both external and internal gears as well as worms. To change the machine over for checking gears of differ-

(Continued on page 4)

MICHIGAN TOOL COMPANY 7171 East McNichols Road DETROIT 12, - - U.S.A.

Morton's Draw-Cut Flash Trimmer Removes Flash & Upset from Welds



The lower horn on this flash trimmer will handle circular work, such as wheel rims, with a minimum dia. of 9 in.

A draw-cut flash trimmer for removing the flash or upset from resistance or butt welds has been developed by Morton Mfg. Co., Broadway and Hoyt, Muskegon Heights, Mich. It is available in sizes ranging from 12- to 28-in. trimming capacity and ¼-in. metal thickness.

The operating cycle is automatic. The work is placed over the lower horn, and when the pedal is pressed, the upper ram automatically lowers and clamps the work. The rams trim on the draw-cut (inward stroke), and when the cut is completed, the upper ram lifts approximately 2 in., and both rams return to the outward position and stop. As soon as the machine starts unclamping, the operator can remove and insert new work.

Each ram is provided with three or more toolholders. Adjustable-bit cutters are used, and a Norton electric cutter-grinder unit with gages and fixtures for cutting-tool maintenance is available.

The machine can be furnished for cylindrical, rectangular or flat work up to ¾ in. maximum thickness. The operating distance from the center of the rams to the floor is approximately 55 in. and can be varied to suit requirements when specified.

Flash Circle-Burning Device Cuts Circles to Edge of Plate

The Flash circle burner is manufactured by Scientific Research Co., 1618 N. Vancouver Ave., Dept. F-18, Portland 12, Ore. A torch attachment for cutting accurate circles, curves or straight lines in plate, it is designed to eliminate guesswork and save time.

Height and radius adjustment are provided. Circles from 2½- to 17-in. dia. may be cut. An extension bar with adaptor makes it possible to make cuts up to 10-ft. dia.

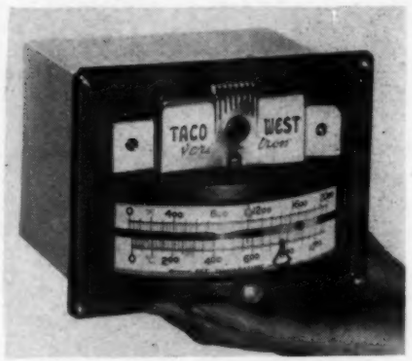
The burning torch is held parallel to the centering pin, and the tracking wheel is heat-treated to prevent gumming or sticking. The wheel may be set behind the head to allow burning to the edge of plate.

Beatty Simplified Spacing Table Takes I-Beams Without Adjustment

A simplified spacing table to handle I-beams for flange punching without any adjustment of the table has been announced by Beatty Machine & Mfg. Co., Hammond, Ind. The table is designed for use with Beatty toggle punches.

The handling is accomplished by carrying the beam on the underside of the top flange, which is always at die level and free to pass over the dies, regardless of the size of the I-beam. Previously the beams were carried on the underside of the bottom flange, and the rolls had to be adjusted to meet varying sizes.

Taco West Electronic Veritron Controls Furnace Temperatures



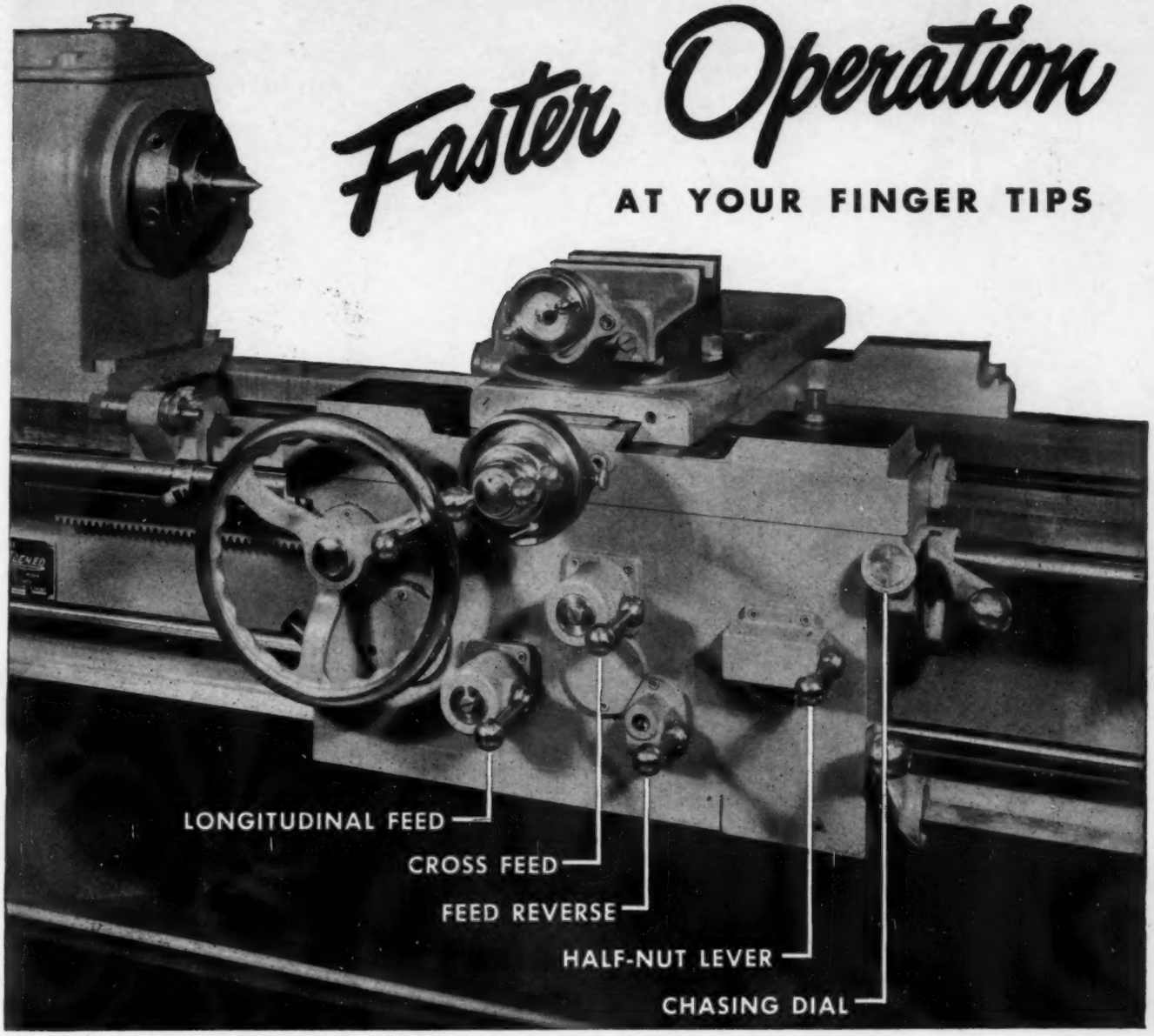
The Veritron electronic pyrometric controller is made by Taco West Corp., 2620 S. Park Ave., Chicago, Ill. A two-position controller, it is especially suited for installation on industrial furnaces and plastic-molding machines.

When the control pointer is set at desired temperature, control is immediately established within a narrow range. Instrument movement operates a heavy-duty relay which has 3-kw. non-inductive load capacity.

The electronic mechanism is unaffected by line voltage variation, surge effects, tube ageing or component changes. The measuring system is compensated for junction deviation, moving-coil temperature coefficient and magnetic errors.

Faster Operation

AT YOUR FINGER TIPS



With the Monarch Model C Toolmaker's Lathe

Flip the lever down—and you've engaged the feed! It's as simple as that, with the Monarch Model C Toolmaker's Lathe. We've designed the apron with four *uniform* lever controls—for greater speed, easier operation. The same downward motion engages each lever—and the same upward motion disengages it.

This flush-mounting of controls not only means faster operation, but faster cleaning—and less chance for accidents or mistakes. It's only *one* of many advantages we've incorporated in the apron of the Model C—the toolmaker's *standard* for precision and *production*.

All revolving shafts are ball-bearing mounted; all gears are alloy steel, hardened and ground, or shaved. There's automatic, metered, pressure lubrication to all moving parts during both longitudinal and cross feed. Notice, too, how the placement of the chasing dial makes reading unusually easy.

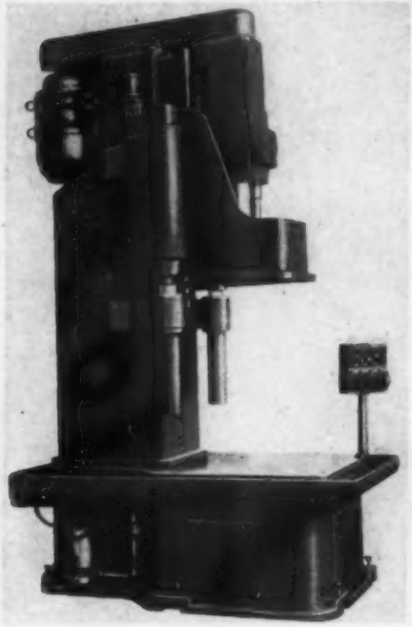
What do design features such as these mean to you? Just this: When you want the latest, the fastest, the most economical in precision metal turning—look to Monarch. May we send you up-to-date catalog information on Monarch's Model C Toolmaker's Lathe—"for peak production at a profit"?

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

Robbins Automatic Driller Adapts to Special Purposes



An automatic drilling machine, the No. 3 Drillmatic, has been announced by Robbins Engineering Co., 318 Midland Ave., Detroit 3, Mich. Built as a standard machine tool to lower costs, the Drillmatic is specifically for special-purpose adaptions.

Interchangeable tooling heads are mounted on the saddle by means of standard locating and hold-down holes. Any number of spindles may be included in the head to be driven by the machine spindle.

Two guide bars are gripped in the saddle and slide in four large bushings mounted on the machine column. Bars and bushings are hardened and ground alloy steel, and each bushing is automatically lubricated.

When the tools are cutting, the saddle is adjacent to the bushings and has maximum support. The counterweighted saddle is operated by a ram from the hydraulic unit mounted on the top of the column. Thus the pressure is directly over the work, and tool-thrust friction on the guide bars is said to be eliminated.

The hydraulic-power unit is fully enclosed and self-contained. A variable-delivery pump increases hydraulic pressure in direct proportion to increasing (or decreasing) resistance to machine thrust.

By using change gears within the unit, or by changing the V-belt cone pulleys on the motor and spindle, a wide variety of spindle speeds can be obtained. The operating cycle can be adjusted to provide rapid approach, two adjustable rates of feed, dwell and rapid return, and stop.

Several operations may be performed with one clamping by mounting auxiliary units around the base in horizontal, vertical or any angular position. "Wings" are welded to the base at the required position to make the auxiliary an integral part without the cost of special base patterns and castings.

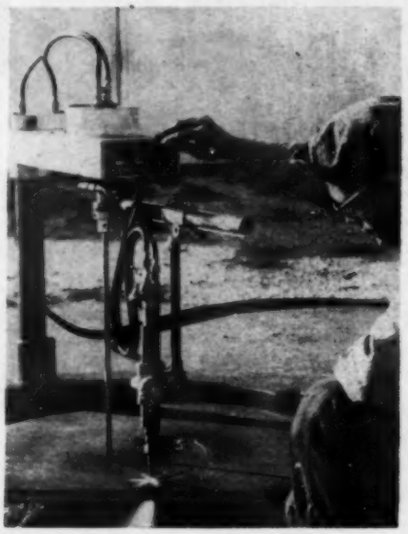
Kaukauna's Indexing Table Supports Heavy Workpieces

The Model 700 indexing table is manufactured by Kaukauna Machine Corp., Kaukauna, Wis. to support heavy workpieces without deflection. Originally designed for use with the series 125 portable, horizontal drilling and tapping machines, it is used with other machine tools and for inspection and layout.

The cast-iron bed has T-slots in the top and at each end for clamping purposes, and work can be mounted either horizontally or vertically. A setup can be made at one end while work is being mounted at the other end. The ribbed cast-iron indexing platen has a 36-in. dia., is manually operated, can be locked in any position, is in the center of the bed and is supported by an extra-capacity ball thrust bearing.

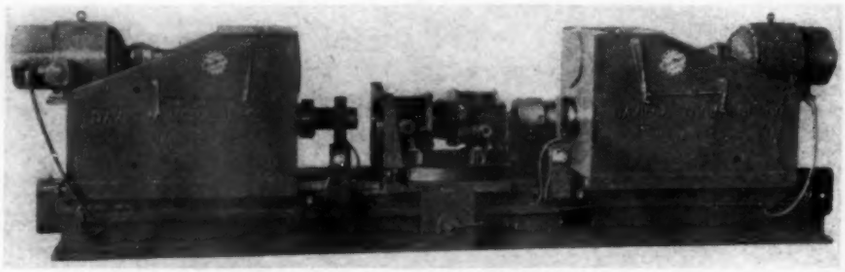
Over-all dimensions are 72 in. long, 36¼ in. wide and 29 in. high.

Ohmstede Circle-Cutting Device Cuts and Bevels at Same Time



A circle cutter, which needs no electrical connections but has a self-contained power unit, is made by Cutting Machine Div., Ohmstede Machine Works, Beaumont, Tex. Weighing 90 lb. complete with torch, the machine consists of a semi-circular support, a main column, and an overhead aluminum arm which houses the hydraulic speed-control unit and the power unit. The spindle projects from the arm and carries the torch in a circular path. The torch can be set to cut up to 40 in. dia. It can be set at any desired angle, and thus cuts and bevels the circle at the same time.

The power to drive the unit comes from a sealed coil spring which is wound by rotating the arm 1 1/3 rev. counterclockwise. The speed of the torch is varied by adjusting the control knob which regulates the flow of oil from the hydraulic valve into a reservoir.



BORING MACHINE—The 2 WI 2-way boring machine is made by Davis & Thompson Co., Milwaukee 14, Wis. to bore large holes to accurate dimensions at high production rates. The machine illustrated bores a 14¾-in. dia. hole from one side and a 9-in dia. hole from the other side. Both holes are 12 in. deep. The workpiece is a locomotive air compressor, and two units or 8 holes are bored per hr. Spindle speeds on each individually driven head are 330 to 1000 rpm. through V-belts, or 60 to 300 rpm. through back gears

"Young Man with a HORN"

What appears to be a glass saxophone in the hands of a Sinclair Laboratory technician is in reality an important instrument used in protecting you against lubricants with low resistance to oxidation.

It's part of Sinclair's apparatus to determine oxidation rate of both non-additive and additive type lubricants. It is used constantly by Sinclair in Research and Refinery Control to assure you of maximum lubricant life without formation of harmful corrosive acids, varnish or carbon deposits on working surfaces.

Resistance to Oxidation is a prime requisite of all good lubricants. Sinclair's "Young Man With A Horn" — and others equally painstaking — stand guard constantly at Sinclair Laboratories to assure you that any Sinclair Lubricant you buy has the very highest degree of quality necessary for maximum operating efficiency.

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Metal Cutting Oils
(Embodying Film Strength Characteristics)
ORDNANCE OILS
Permit deeper cuts at higher speeds

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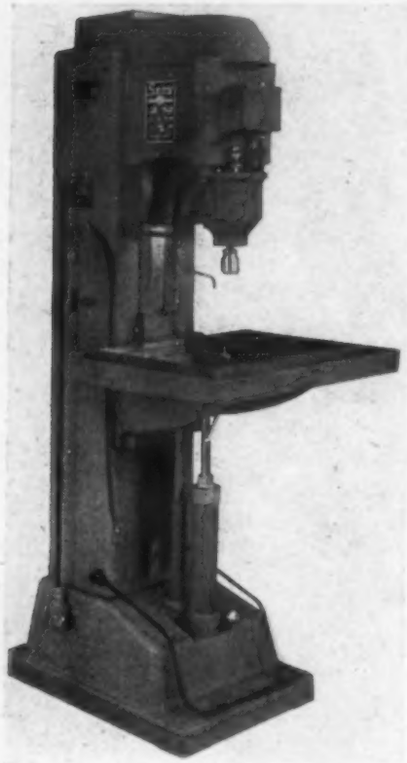
FINEST CRUDES + EXPERT RESEARCH and MANUFACTURING CONTROL = OUTSTANDING PERFORMANCE

Snow Air Tool is Basic Machine For Drilling, Tapping, Threading



The Snow air tool, a basic machine which can be used in drilling, threading and tapping operations, is built by Snow Mfg. Co., 615 S. California Ave., Chicago 12, Ill. The illustration shows the machine used as the 4-UT universal tapping machine.

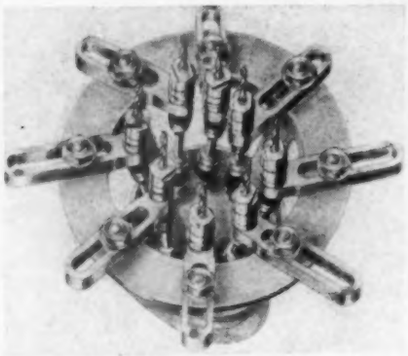
The basic machine has an air-operated table-raising and -lowering unit, a cast-aluminum air head, a bale-type pedal, and electric controls available through a full-length door in the back of the column. Automatic or controlled operating cycles are provided by microswitch-activated solenoid valves, which also synchronize the head with automatic, semi-automatic or manually operated holding fixtures. Around the basic tool are built a drillpress, a threading machine or a universal tapping machine.

The drillpress has infinite feed, split-second control and automatic withdrawal of drill. It is available in two sizes: type 1-UD with a rated capacity in mild steel up to ¼ in., and type 2-UD for ⅛ to ⅜ in.

The threading machine operates at high threading speeds and comes in sizes No. 3 and No. 4.

The universal tapping machine taps for any class fit and is said to have correct pressure for each tap size and every pitch instantly available. It comes in four sizes: type 1-UT with a rated capacity in mild steel of No. 2 to 10 (or 3/16 in.), type 2-UT for No. 6 to 5/16 in. N.F., type 3-UT for No. 10 to ½ in. N.F., and type 4-UT for ¼ to ¾ in. N.F.

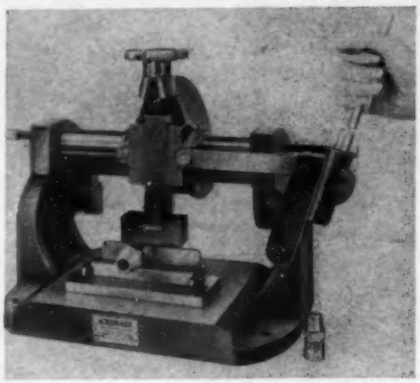
Commander Adjustable Drillhead Drills Eight Holes at One Time



An eight-spindle adjustable drillhead is made by Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill. The Multi-Drill can be attached to any drillpress and will drill eight holes at one time in any hole pattern within a 9-in. circle to a minimum center distance of ½ in.

Incorporating the same features as the six-spindle model, the drillhead is positioned by loosening one nut on each locating arm, positioning the spindle and tightening the nut.

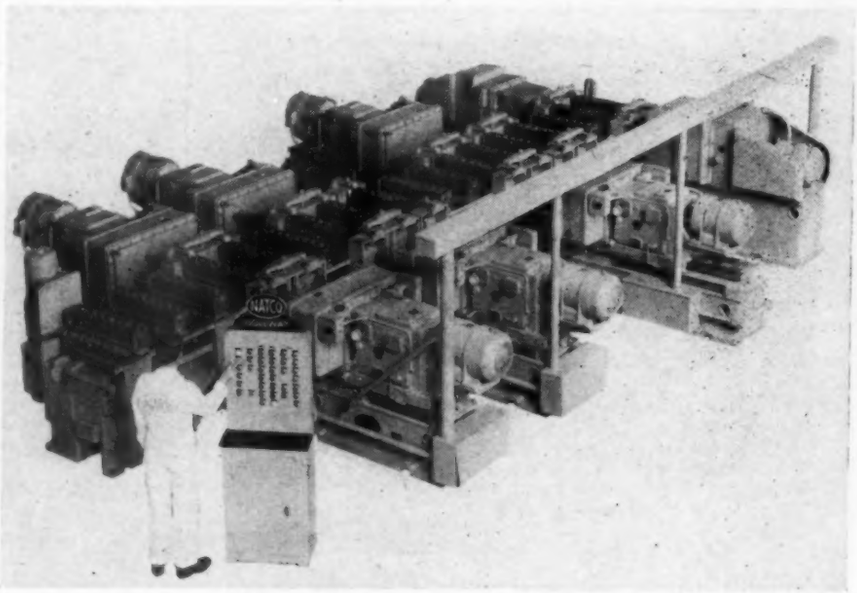
Acromark Co. 9A Marking Fixture Takes Various Sizes of Couplings



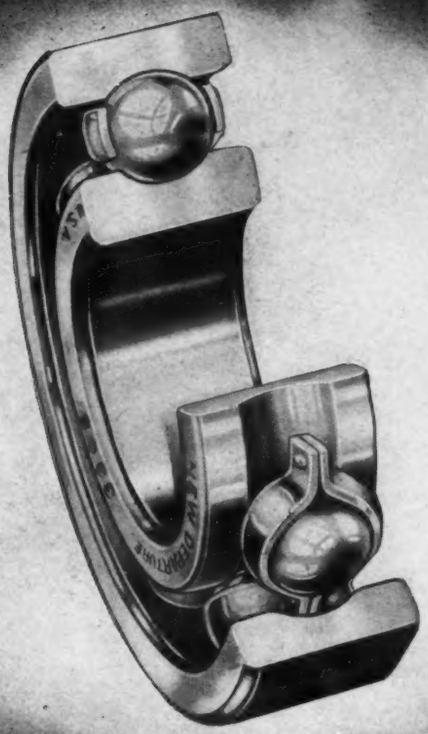
The 9A fixture is made by Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J. Designed to be screwed to the bed of any Series 9A marking machine, it is an adjustable device which permits various sizes of couplings to be marked.

An adjustable backplate stop also acts as a straight-edge, and the center block of the fixture carries the turned surface of the coupling or part as it is rolled. At each end of the plate is an ear with an elongated hole permitting adjustment by loosening two Allen setscrews.

The 9A marking machine (with 9A fixture) illustrated has been improved by reducing the areas in the die-holding slide in order to reduce friction.



PROCESSING MACHINE—The Holeway, an automatic processing machine which can produce 90 engine blocks per hr. has been developed by National Automatic Tool Co., Inc., Richmond, Ind. The machine, which involves 19 stations, drills 25 holes and countersinks or taps many of them. One operator is needed for the controls, while the machine automatically advances the work from one station to the next and ejects it onto a roller conveyor at completion



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- Every kind of load
- Lower maintenance costs
- Less friction — less wear

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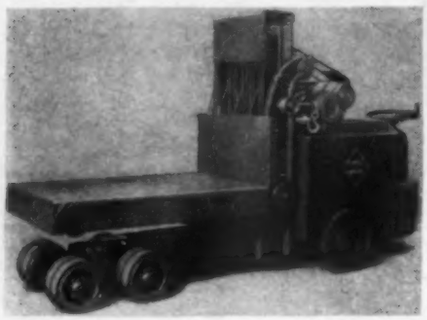
NEW DEPARTURE • DIVISION OF GENERAL MOTORS—BRISTOL, CONN. • Branches in DETROIT • CHICAGO • Other principal cities.

Elwell-Parker Power Truck Handles Dies Up to 25 Tons



A 25-ton capacity die-handling power truck has been developed by Elwell-Parker Electrtic Co., Cleveland, Ohio. The platform is 53 in. wide and 72 in. long.

To load a die, the platform is elevated to the level of the press bed. Cables wound on power-operated reels are passed under the pulleys on the upright column and are hooked together at the far end of the die. The cables are reeled in, sliding the die from the bed onto the platform.

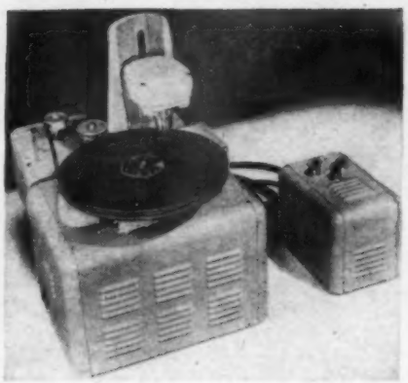
To place a die on a bed, the cables are passed under the forward pulleys and brought back and hooked behind the near end of the die. One man can perform either operation.

Air-Hydraulics 6-Ton Press Assembles, Rivets, Embosses

A 6-ton capacity air-hydraulic press has been added to the line of 2½-ton presses manufactured by Air-Hydraulics, Inc., 401 Broadway, New York 13, N. Y. The press is used on metal, plastics and leathers for assembly, riveting, embossing, sizing and other operations.

A ratio of 120:1 on the air-intake pressure is provided. The press may be plugged into the present airline.

Ram pressure, which is constant through the stroke, is adjustable from delicate pressures up to 12,000 lb. Speed is up to 300 ipm., and stroke is adjustable from 1/16 to 5 in. A predetermined ram dwell, single cycle or automatic cycle, can be furnished. Foot, hand or solenoid pushbutton control valves are used, making the press suitable for women operators.



INSPECTION SYSTEM—An automatic inspection system for small parts has been announced by Arma Corp., 254 36th St., Brooklyn 32, N. Y. The system is an electronic light-indicating comparator and handles parts up to 1½in. sphere size. It automatically inspects, counts, sorts and places parts into good and rejected groups. It can be used with manual or hopper feed and is said to be able to take up to 7000 pieces per hr.

Taylor-Winfield Press Welders Give Welding Forces to 1575 lb.

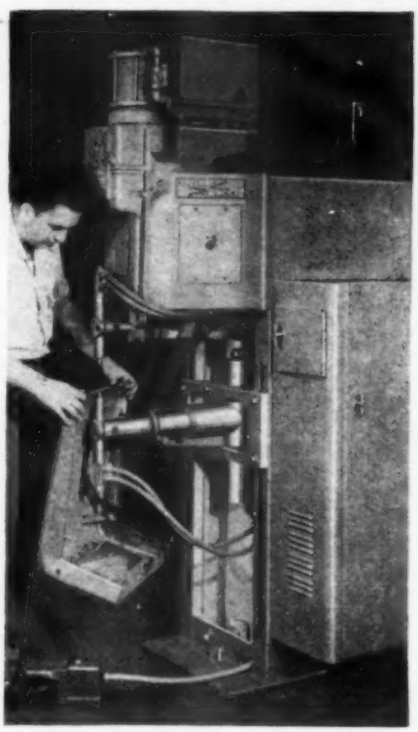
The type ENB air-operated press welder has been developed by The Taylor-Winfield Corp., Warren, Ohio. Available in two styles, the welder has a roller anti-friction welding head designed to permit high off-center welding forces, minimize deflection and insure ram alignment.

A bellows air lock is incorporated to eliminate the effect of inconsistent friction of air cylinders over long periods of time. The transformer has "damage resisting" construction, and provision is made for side-mounted electrical controls.

Style 1, available in four types, is either a projection welder or a combination projection and spot welder when horns are used. Throat depth to platen center is 12, 18, 24 and 30 in. Standard welding forces are 1575, 1275, 1275, and 1000 lbs. Platen area is 6x6 in. with T-slots on 3½-in. centers. Vertical adjustment of the lower knee is 8 in.

Style 4, also available in four types, is a spot welder with a swiveling lower horn. Throat depth to electrode center is 18, 24, 30 or 36 in. Standard welding forces are the same as Style 1. Vertical adjustment of the lower horn is 8 in.

The bellows air lock maximum welding force is 1275 lb. The welders operate on single phase, 50/60 cycle, 222, 440 or 550 v. Other voltages can be used with electronic contactor and electronic timer controls.



The maximum swing of the swiveling vertical horn on this Style 4 spot welder is 30° either side of center

Bruning Printer-Developer Gives Speeds Up to 30 rpm.

The Model 91 BW Volumatic Printer-Developer is made by Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill. Requiring one operator, the unit accommodates roll stock up to 42 in. wide at speeds up to 30 fpm.

The Volumatic prints all Bruning BW mediums, including transparent paper prints, cloth or film prints, and light-, regular- or card-weight BW paper prints in black or color on white or green-tinted backgrounds.

Control is provided by "on-and-off" pushbutton controls over motors and heaters. A speed-control knob and a calibrated dial enable the operator to select speeds.

Your automatic screw machines will operate longer between tool changes when you use J&L Cold Finished steel. The uniform Controlled Quality of J&L Cold Finished rounds, hexagons and squares makes it possible for you to set the speed of your machines to obtain maximum efficiency. In addition the close dimensions and inherent machinability of J&L Cold Finished bars will make it possible to produce, at low cost, accurate, highly finished parts.

JONES & LAUGHLIN STEEL CORPORATION

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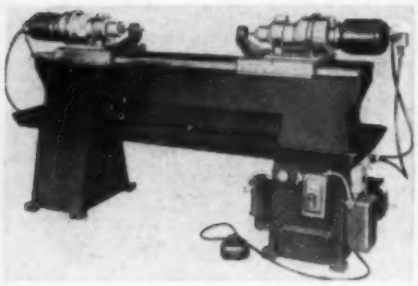
Klatt & Wood Centering Machine Uses Robotrill Drilling Heads

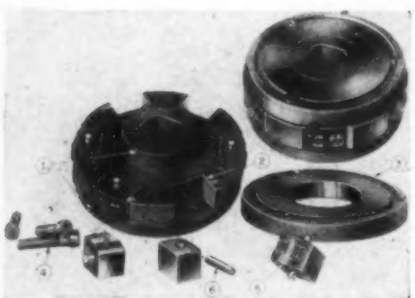


The Robotrill drilling heads, designed to provide robot-like control of drilling operations, and the Robotrill Automatic Cycle centering machine have been announced by Klatt & Wood Co., 329 20th St., Toledo, Ohio.

The heads operate in any position and may be installed in special machines where standard mounting brackets cannot be used. They are self-contained units and use standard motors and precision ball bearings. All parts are keyed together so that only the rear-thrust and front-spindle bearings are subject to wear. Micrometer adjustment of the spindle and depth control to within 0.002 in. are provided. Even pressure on the spindle during the work stroke is obtained by centrifugal force of positive driven balls. The drill spindle releases without shock.

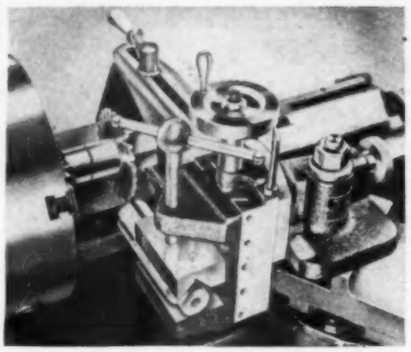
The centering machine can center pieces up to 36 in. or longer and can be adapted for two-way drilling when not used on centering operations. It incorporates two Robotrill drilling heads.

M. E. Cunningham Insert Roll Marks Grades on Steel Tubing



An insert roll for marking steel tubing is announced by M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 19, Pa. The marking (grade identification, company symbol and others) is to be done after the final operation performed on sizing rolls.

The roll consists of (1) a slide ring and hub of high-alloy steel, (2) a type insert ring mortised for the number of inserts needed and (3) a locking ring to hold the type in place. Allen-head setscrews (4) lock the insert ring to the side ring. The inserts (5), which are held in place by steel pins (6), are engraved with the face radius slightly less than the outside diameter of the type ring.

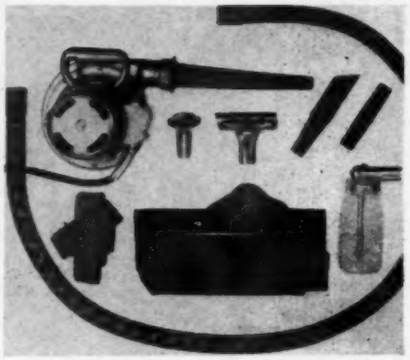


MILLING ATTACHMENT—All-steel K-J Milling Attachment has been developed by Kyle-Johnson Machine Co., 1627 W. Pico Blvd., Los Angeles 15, Calif. A quick-change lathe tool, the device can be mounted on an engine lathe to perform light jobs including milling keyways, flats and small shafts

Acromark Co. Embossing Dies Work Aluminum-Alloy Strips

Embossing dies for working aluminum- or magnesium-alloy strips are made by The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J.

The dies are designed so that the embossed work will have flat faces for the application of color enamel. This is done by finishing the sunk, engraved letters and design of the female die to accomplish a flattening or coining result when the dies are pressed together. The size of the dies is limited only by the capacity of the press used.



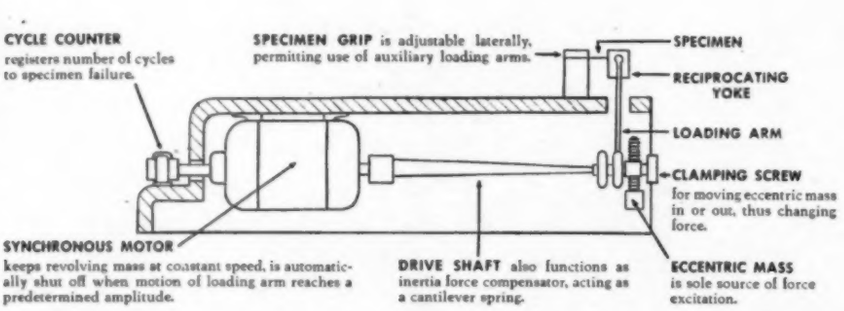
CLEANER—The No. 77 blower and cleaner has been announced by Holub Industries, Inc., Sycamore, Ill. The unit has a 1-hp. sealed ball-bearing motor, a two-speed switch and a heavy-duty three-conductor cord. It blows, vacuums and sprays and has cleaning applications including motors and generators, machinery, furnaces, floors, shelving and ventilators

Sonntag Fatigue-Testing Machine Gives Sheet Stock Flexure Tests

A bench-type fatigue-testing machine, the Sonntag Model SF-2, is available from The Baldwin Locomotive Works, Philadelphia 42, Pa. The machine gives flexure fatigue tests on sheet stock, including metals, plastics and wood, without needing electronic equipment or special devices.

The machine incorporates a "constant force" loading feature by use of a revolving eccentric mass. It avoids using cams or eccentric connecting rods which have to be readjusted during the test as specimen stiffness changes.

The machine can be placed in a cabinet so that atmosphere can be controlled. It weighs 115 lb., has an alternating force capacity of 20 lbs. and a speed of 1800 cycles per min. The total travel of the loading yoke is 1 in. per cycle.


CYCLE COUNTER
registers number of cycles to specimen failure.
SPECIMEN GRIP is adjustable laterally, permitting use of auxiliary loading arms.
SPECIMEN
RECIPROCATING YOKE
LOADING ARM
CLAMPING SCREW
for moving eccentric mass in or out, thus changing force.
SYNCHRONOUS MOTOR
keeps revolving mass at constant speed, is automatically shut off when motion of loading arm reaches a predetermined amplitude.
DRIVE SHAFT also functions as inertia force compensator, acting as a cantilever spring.
ECCENTRIC MASS
is sole source of force excitation.

Auxiliary loading arms increase the bending moment on this constant-force fatigue-testing machine

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Like the champions in the world of sports, Bethlehem's BIG 8 Tool Steels are consistent winners because they are versatile. These old favorite steels will handle more than 90 per cent of your tool and die jobs. The tool room that stocks the BIG 8 is ready to tackle virtually the entire range of tool-steel applications.

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BETHLEHEM'S BIG 8 TOOL STEELS

CARBON TOOL STEEL (water-hardening). For an almost endless list of dies, cutting tools, punches, etc.

BTR (Tool Room) (oil-hardening). A popular safe-hardening steel for dies, punches, broaches, hobs, drill bushings, forming tools, gauges, etc.

OMEGA (oil-hardening). The outstanding shock-resisting steel for cold-battering tools and machine parts subject to shock.

NO. 67 CHISEL (oil-hardening). Primarily for battering and shock purposes on both hot and cold work. Also used for master hobs.

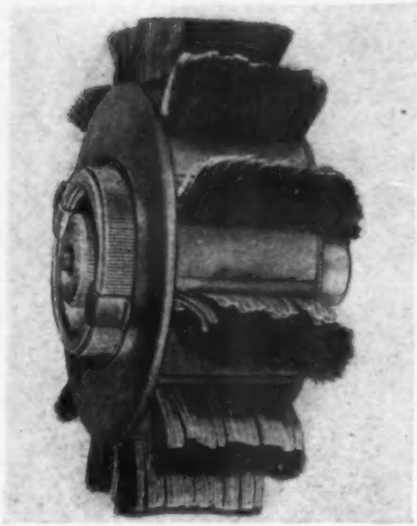
BA-H (air-hardening). This famous air-quenched die steel has a low hardening temperature (1550-1600° F.), slight dimensional change, and develops a hardness comparable to that of liquid-quenched die steels.

LEHIGH H TEMPER (air- or oil-hardening). A high-carbon, high-chrome steel with high wear-resistance. Has minimum deformation in heat-treatment. A steel for maximum production.

NO. 57 HOT WORK (oil- or air-hardening). Especially suitable for tools used for working both hot steel and other hot metals.

BSHS (Special High Speed). A general-purpose, high-speed cutting steel with excellent red-hardness. The popular 18-4-1 type.

Sand-O-Flex Contour Sander Feeds Out 12 Abrasive Strips



A heavy-duty contour sander for finishing or sanding irregular surfaces or edges is produced by Sand-O-Flex Corp., 4373 Melrose Ave., Los Angeles 27, Calif.

The Model 650C can be used on any rotating shaft. It has 12 brush-backed abrasive strips which can be fed out as needed from an internal cartridge. Over all dia. is 10¾ in. including brushes. Housing dia. is 6⅝ in. The bore is ¾ in., and the tool mounts on right or left hand shafts.

The strips are 2½ in. wide, and refills come in various grits and grades in aluminum oxide and garnet cloth.

Almco Line of Deburring Barrels Operates on 4-Step Pulley System

A line of eleven octagonal deburring and finishing barrels is manufactured by Almco Inc., 231 E. Clark St., Albert Lea, Minn. The barrels are of 30-in. dia. and 32- to 60-in. length. They are unlined or have full neoprene lining.

Light-weight compartment doors, which have rubber seals, are opened or closed with a quick-acting toggle clamp. The doors come to within ¾ in. of the end walls.

The barrels are motor-driven at approximately 10, 15, 20 or 30 rpm. through a speed reducer. A 4-step V-belt pulley system with a lever-operated belt-release mechanism permits quick selection of speed.

There is a 28-in. clearance beneath the barrels for free unloading. They are equipped with guard rail and pull-down safety hood.

O'Brien-Volz Combination Uses Clamp and Drum Cutter

The O'Brien-Volz Combination, which uses a drum cutter and a clamp to convert steel barrels to tote boxes or containers, has been announced by Merrill Brothers, 56-04 Arnold Ave., Maspeth, L. I., N. Y.

The O'Brien steel drum cutter removes the top of any steel barrel. Then the Volz double-action forged clamp is used to provide a means for lifting. The clamp can also be used for lifting plates, angles and kegs.

Childs & Co. Knee-Type Miller Has 6-in. Longitudinal Feed

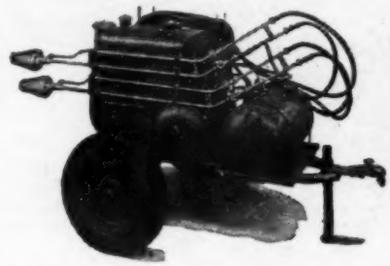
The No. 0000 knee-type milling machine has been developed by Childs & Co., Conneaut, Ohio. A small miller, it is designed for such users as manufacturers of small parts, tool and die shops, and instrument makers.

Longitudinal feed is 6 in., traverse is 1½ in. and vertical feed is 4 in. Table accuracy is held to 0.001 in., and a 0.0001-in. tolerance is held by the spindle run-out.

The bench unit illustrated is 14½ in. high. It can also be used on a pedestal. In either case a double V-belt drive comes up through the column. A jackshaft and countershaft with V-belt pulleys give nine speeds from 280 to 11,150 rpm.

A ½-hp. motor is recommended, although a 1/3- or ¼-hp. motor can be used if only light cuts will be made. The unit weighs 75 lb.

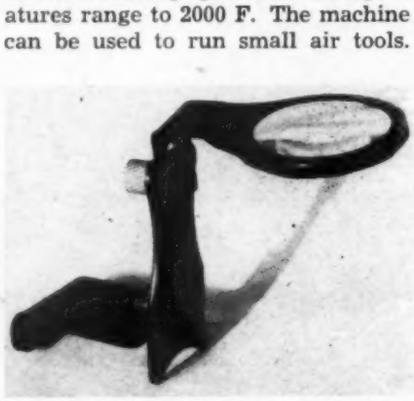
Aeroil-Schramm Power Burner Gives Flames up to 15 ft.



The Aeroil-Schramm power-driven burner is manufactured by Aeroil Products Co., 5701 Park Ave., West New York, N. J.

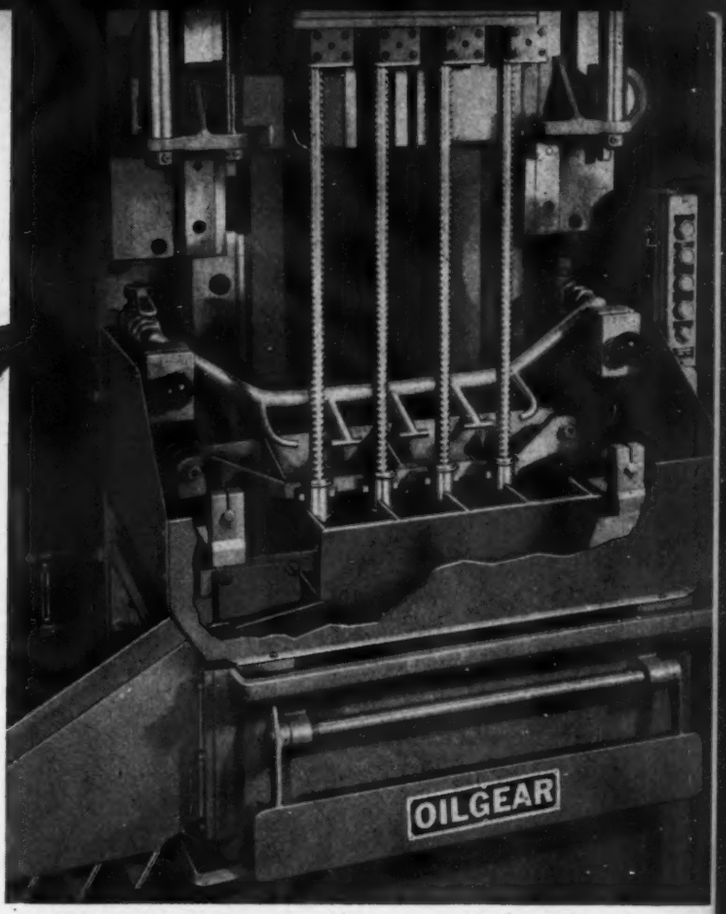
Originally intended as a weed burner or for highway engineers or railroads, the burner has applications in industry such as: straightening, bending, shrinking and expanding work; skin-drying foundry molds; heating of plates, ribs and girders; and general repair work.

Flame lengths from 6 in. to 15 ft. can be obtained in vertical or horizontal working position. Temperatures range to 2000 F. The machine can be used to run small air tools.



ADJUSTABLE MAGNIFIER—A magnifying unit for general tool and die making, spot checking, inspection and general use is made by Dayton Rogers Mfg. Co., 2835 12th Ave. South, Minneapolis 7, Minn. The unit has a 1½-in. dia., universal mounting, 2-in. height adjustment, and maximum overall height of 3½ in.

OILGEAR *Pull-Down* BROACHING



Broaching 3 splines in 630 Bicycle Coaster Brake Hub Shells per hour on an Oilgear Type XP-30 x 54" machine. Operator merely loads 4 parts and depresses start buttons. Multiple tool handling and ejection of parts are automatic.

SAVES TIME AND LABOR by freeing both hands of operator for loading work . . . by handling tools automatically . . . by threading and accurately centralizing work automatically . . . by broaching at speeds coinciding with operator's ability to serve machine.

SOLVES FINISH, ACCURACY AND PRODUCTION PROBLEMS by positive, pressure lubrication and cooling of tools and work . . . by causing chips to quickly fall away from tools and cutting zone . . . by securing tools at both ends during major portion of cutting stroke . . . by eliminating possible tool sag . . . by multiple operations per cycle . . . by more parts per grind and longer tool life . . . by controlled, higher broaching and return speeds. Unloading can be automatic. Loading, broaching and unloading can be performed without an operator.

See 21 large illustrations of broaching diversified parts . . . the time, labor and power-saving design and operational features and complete specifications on 10 standard Oilgear Pull-Down Broaching Machines as published in our new 24 page Bulletin 25000. Send the convenient coupon below for a free copy today. THE OILGEAR COMPANY, 1315 W. Bruce Street, Milwaukee 4, Wis.

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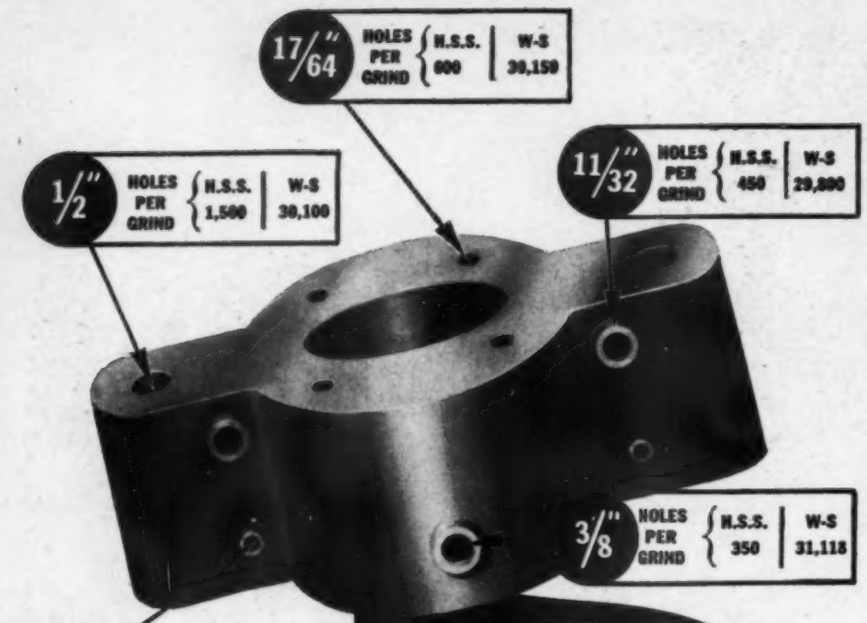
17/64" HOLES PER GRIND H.S.S. 600 W-S 30,150
1/2" HOLES PER GRIND H.S.S. 1,500 W-S 30,100
11/32" HOLES PER GRIND H.S.S. 450 W-S 29,800
3/8" HOLES PER GRIND H.S.S. 350 W-S 31,118
11/64" HOLES PER GRIND H.S.S. 1,010 W-S 50,875

Average
34,268 HOLES
PER GRIND
with
WENDT-SONIS
CARBIDE TIPPED
TWIST DRILLS

Records of drill performance kept by a large manufacturer producing cast iron parts, show how W-S Carbide Tipped Twist Drills average 43 times more holes between grinds. Comparisons were made on drilling operations in cast iron. Parts were drilled on multiple-spindle automatic machines. For faster, cleaner lower-cost drilling, try Wendt-Sonis Carbide Tipped Twist Drills in your work. These tools are recommended for drilling plastic and other non-metallic materials as well as non-ferrous metals. Get details in connection with your job requirements.

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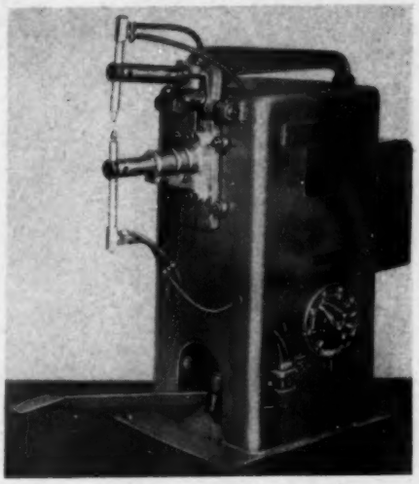
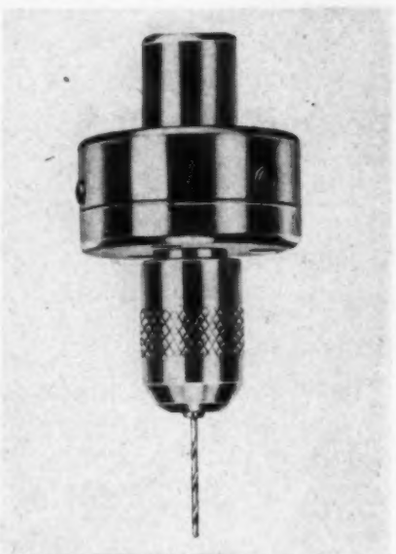
Thomson Rocker-Arm Spot Welders Handle Light-, Medium-Duty Work



The R-series rocker-arm spot welder for work in the light to medium range is announced by Thomson Electric Welder Co., Lynn, Mass. The welder is available as a foot-, air- or motor-operated machine with 12, 24 or 30-in. throat depth and 20, 30 or 40 kva transformer capacity.

Electrodes and transformers are water cooled by individual circuits with flow control and visual drain. An 8-point positive-clamp type heat regulator with a star locking wheel is designed to prevent drift and insure efficient contact. Speeds up to 120 spots per. min. can be obtained.



MICRO DRILL CHUCK—Micro drill chuck developed by Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill., is designed for two collet sizes: 0.005 to 0.025 in. and 0.020 to 0.0040 in. To correct for chuck runout, the chuck can be aligned to absolute concentricity, need not be adjusted when drill is changed

Black & Decker 5/8" Heavy-Duty Drill drilling holes for door frame bolts at Harrisburg Truck Body Co.

Black & Decker 1¼" Heavy-Duty Portable Electric Drill driving reamer to drill bungholes in barrels

These RUGGED DRILLS Speed Up Heavy-Duty Work

Turn your toughest drilling jobs over to Black & Decker *Heavy-Duty* Electric Drills . . . and watch your output jump! These high-powered Drills handle *continuous,* heavy-duty drilling, wood boring and hole sawing. From spade handle to chuck, they're built to take it! Their heavy-duty, B & D-built motors are specially constructed for constant service. Heavy-duty gears and ball bearings are used throughout. Roller bearings on chuck spindle withstand severe side and end thrust.

Wherever you are, there's a Black & Decker Distributor near you. Ask him about these Heavy-Duty Drills today. Remember, he's as close as your phone and ready to help on *any* tooling problem. For your copy of our catalog, write to: The Black & Decker Mfg. Co., 616 Penna. Ave., Towson 4, Md.

Here's why it pays to *Standardize* on Black & Decker Drills

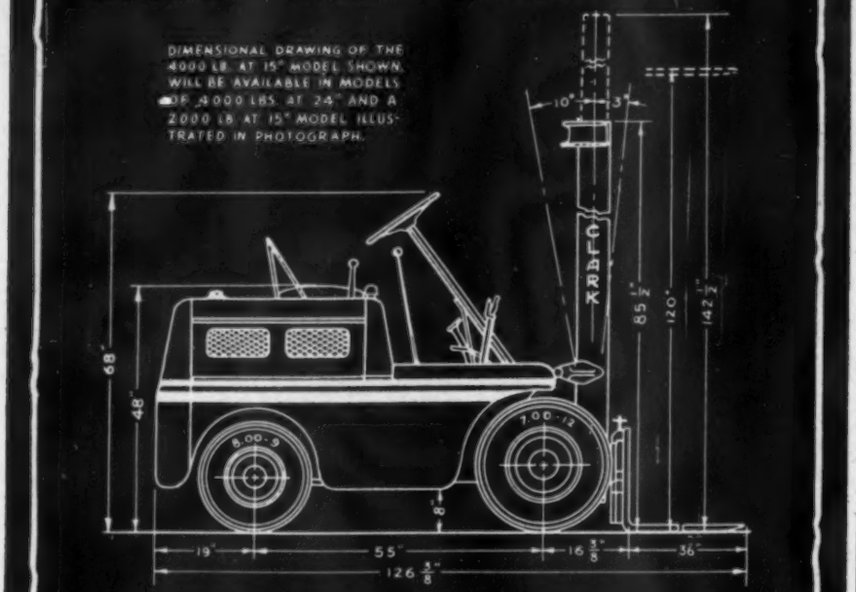
When you standardize on Black & Decker Electric Drills, you get a wide choice from the world's most complete line—capacities from ¼" to 1¼". You enjoy the facilities of any of 26 Black & Decker Factory Branches, offering complete service on replacement parts and repairs. You receive expert help from a close-at-hand Black & Decker Distributor.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

A NEW SERIES OF PNEUMATIC-TIRED FORK TRUCKS . . .



BY CLARK — THE OUTSTANDING NAME IN MATERIAL HANDLING

Announcing the

YARDLIFT-40
YARDLIFT-20*

The new YARDLIFT series is built especially for tough and rough going—moves one- and two-ton loads smoothly over bumpy yards and crossings, slick floors and docks.

Featuring the stability of four-wheel design, yet amazingly maneuverable, these machines afford easy operation, easy riding—the newest thing in mobile powered equipment, designed to meet a specific need in material handling.

Equipped with pneumatic tires and a pivoted steering axle mounting — the YARDLIFT is as easy on the cost sheet as it is on the operator.

Write for specification bulletins on both of these new fork trucks, and for the modernized "MATERIAL HANDLING NEWS", just off the press, showing New Machines and New Devices.

**YARDLIFT—20 PRODUCTION JUNE '47*

CLARK TRUCTRACTOR
Division of CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN
OTHER PLANTS — BUCHANAN, JACKSON, BERRIEN SPRINGS, MICHIGAN

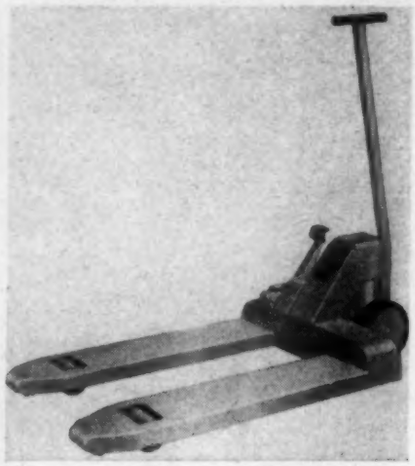
Other CLARK Products

FORK LIFT TRUCKS
TOWING, DUMP AND SHOVEL TRACTORS
RAILWAY TRUCKS
DRILLS & GEARS
ELECTRIC STEEL CASTINGS
METAL SPOKE WHEELS
AXLES & HOUSINGS
TRANSMISSIONS

Prices on CLARK products will not be advanced in excess of increased costs.

CUT COST FACTORS WITH CLARK TRUCTRACTORS

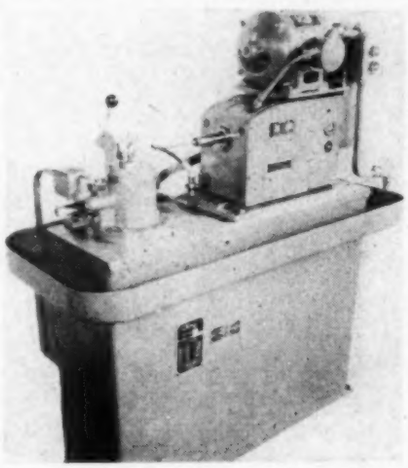
Lyon-Raymond Hand Pallet Truck Has Lightweight Construction



A 2000-lb. capacity hand pallet truck has been announced by Lyon-Raymond Corp., 3173 Madison St., Greene, N. J. Lightweight construction is provided by use of aluminum in non-structural parts and wheels, and of alloy sheet-steel box sections in the frame.

A hydraulic foot pump with optional length stroke drives the elevating mechanism. A relief valve prevents overloading and possible damage to the pump.

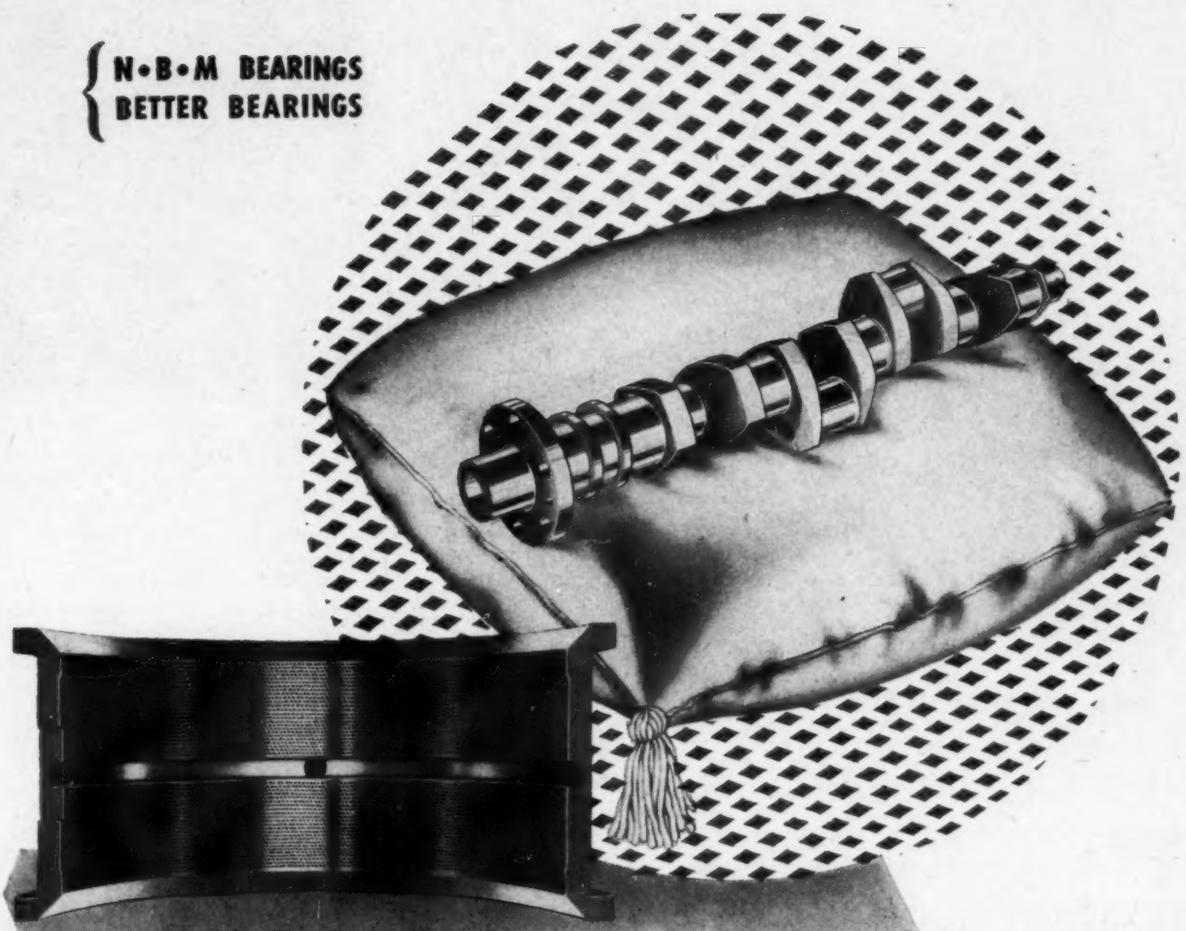
Avey Nos. 1 and 2 Cam Feed Units Drill, Ream, Counter-Bore and Tap



The No. 1 and No. 2 Cam Feed units for drilling, reaming, counterboring and tapping have been developed by Avey Drilling Machine Co., 118 W. 2nd, Cincinnati, Ohio. The units are self-contained with electric controls for operation and synchronization of multiple-unit setups.

No. 1 has a ½-in. capacity in cast iron, and No. 2 has a ⅞-in. capacity. The design of the units eliminates manual operation of the spindle.

N•B•M BEARINGS
BETTER BEARINGS



N•B•M GRIDDED BEARINGS –A *Cushion* FOR SHAFT DEFLECTION

A multitude of precision-spaced grids, filled with N-B-M Silver Babbitt, form a protective "cushion". It provides plenty of "give" to conform to shaft deflection and covers up unevenness and destructive grit.

This interlocked bi-metallic construction gives Centrifugally Cast N-B-M Gridded Bearings greatly increased resistance to fatigue, seizure, and overstress in high-speed, heavy-load machinery where maximum safety is needed.

Write today for complete engineering data.

NBM

Brake Shoe NATIONAL BEARING DIVISION
ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

OUT OUR WAY

YOU AIN'T HURT, PHIL? STAY RIGHT THERE A MINUTE--WE WANT TO INVESTIGATE THE CAUSE OF THIS!
IT USED TO BE A DISGRACE TO GET CAUGHT IN A MACHINE WHEN THEY WAS EASY TO GET CAUGHT IN--NOW WITH THEM MADE SAFE, YOU'RE A KIND OF HERO!
IT WASN'T TH' MACHINE'S FAULT-- STEPPED RIGHT INTO THAT OIL--SLID RIGHT INTO TH' MACHINE! NOW MEBBE WE'LL GET SOL-SPEEDI-DRI!
J.R.WILLIAMS
FOOLING THE INVENTOR
T. M. REG. U. S. PAT. OFF. COPR. 1946 BY NEA SERVICE, INC.

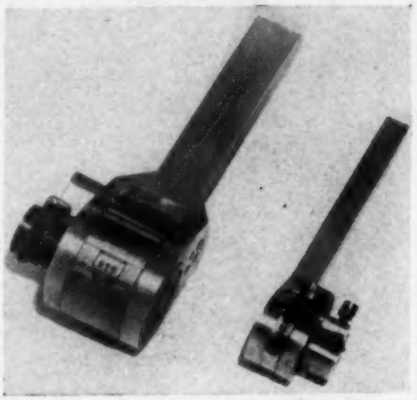
IS YOUR SHOP THE "STOMPING-GROUND" FOR ACCIDENTS?

Contrary to the popular saying, accidents don't just *happen!* They are caused . . . and the most frequent cause of accidents in the shop is greasy, oil-slick floors. Put a firm footing under your employees with SOL-SPEEDI-DRI . . . and watch *accident-rates* take a fall! SOL-SPEEDI-DRI is the fast-working absorbent that soaks up all liquids like magic. Reduces fire-hazards, too, for SOL-SPEEDI-DRI will not readily burn, even when oil-soaked.

SUPPLIERS: *East*—Safety and Maintenance Co., Inc., No. 1 Wall Street, New York 5, N. Y. *South, Midwest, West Coast*—Waverly Petroleum Products Co., Drexel Bldg., Phila. 6, Pa.

LEVER-TYPE DRAWBAR—The Precision lever-type drawbar for production use on ½-in. collet-capacity lathes has been developed by General Die and Stamping Co., 262-272 Mott St., New York 12, N. Y. Used on lathes such as Atlas, Logan and South Bend, and where there is a slight variation in work diameter, the drawbar adapts itself automatically. It is provided with a range of three positions of tension adjustment

New Method's Roll Marker Prints Metal Automatically



An automatic roll marker for imprinting letters, numbers, calibration lines and serrations on finished metal parts is made by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich. The marker can be used for right- or left-hand operation.

"Changeover" arrangement permits the adjustable stop, stop-dog and spring return to be shifted as an assembly from one side of the marker to the other to obtain position suitable to spindle rotation. Rolls are available in either solid or interchangeable type. The shanks are designed for mounting on conventional holders and are custom made to meet specific requirements.

POP'S SCHOOL of FILING

"PLAY IT SAFE WHEN FILING A DIE"—says Pop the Foreman

THE exacting requirements of diemaking put an extra-high responsibility on using *The right file for the job.* To guard against irregularities, inaccuracies, or too much metal removal, many operations (as in corners) call for machinists' files with at least one "safe" (uncut) edge. Accurate cut, uniform hardening, and absolute straightness are likewise essential. These qualities are scrupulously maintained in Nicholson files. They are reasons why expert diemakers, by a large majority, choose this world-famous brand.

Action and close-up views show the Nicholson Hand with one "safe" edge. A good complement of machinists' files suitable for general diemaking consists of the following shapes and cuts for "roughing" and finishing:

HAND – *Bastard double cut with one "safe" edge.*
HAND FINISHING–*Smooth double cut with two "safe" edges.*
PILLAR–*Bastard and Smooth double cut with one "safe" edge.*
SQUARE BLUNT – *Bastard double cut.*
ROUND – *Bastard spiral (double) cut.*
HALF ROUND TAPERED – *Bastard double cut back and flat side; Smooth single cut back and double cut flat side.*
THREE SQUARE TAPERED–*Bastard and Smooth double cut.*

• For small precision dies, ask about the wide variety of Nicholson X.F. Swiss Pattern Die Sinkers Files and Riflers.

For *The right file for the job* and the sweeping guarantee of *Twelve perfect files in every dozen* ask your industrial distributor for Nicholson or Black Diamond.

NICHOLSON U.S.A.

NICHOLSON FILE CO. • 29 ACORN STREET, PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

NICHOLSON FILES FOR EVERY PURPOSE

In Wright Cyclone Aircraft Engines, Ampco Extruded Bronze is specified for bushings, fuel injection nozzle inserts, and other parts — for its efficiency at extreme temperatures, its corrosion resistance, and its strength-weight ratio.

Flyin' high-and lasting longer because they're Ampco extruded bronze

Wear-resistant aircraft parts cost less when machined from Ampco extruded stock

Exceptionally high strength-to-weight ratio is an indispensable asset for aircraft parts. This quality is one of seven outstanding performance advantages of Ampco aluminum bronzes—advantages which give *better* and *longer* service for vital parts subject to wear in any application.

Extra economies are afforded when you can use Ampco extruded bronze rods. Extruded stock provides sizes close to most requirements—reducing waste and machining time; the smooth finish and compact structure cuts down rejects caused by physical flaws.

Two grades of Ampco Metal and two grades of Ampcoloy (industrial bronzes) are regularly produced in extruded form by Ampco. Rods in a complete range of sizes are available for immediate shipment. Write for Bulletin 64A for complete details.

Ampco Metal gives these 7 outstanding performance advantages . . . Resistance to — Corrosion • Compression • Impact • Fatigue • Wear — Excellent bearing qualities • Efficiency in extreme temperatures.

AMPCO Metal

Ampco Metal Inc., Dept. AM-4
Milwaukee 4, Wisconsin
Field Offices in Principal Cities

A-33

ROUND TABLE *Discussion*

OLD MAN JONAS DOESN'T LIKE IT

Of course he doesn't. How many of us ever do? . . . I'm getting within very measurable distance of retirement myself and I don't like it. But, if by the time one is getting on into the 60's one has not learned that there is at least one more thing as certain as death and the rent day, and that is changes with the times, one has badly wasted one's time and shows a regrettable inability to assimilate information from irrefutable evidence.

That is not to say, of course, that all change is to the good or to be accepted without argument or protest.

As a business gets bigger, it is almost inevitable that the manager loses his intimate contact with the shop—how can it be otherwise? In a shop with a dozen men, the owner can be the manager, designer, foreman and salesman, and can know personally and intimately all his staff.

Increase this to twice the size and he will almost certainly need to delegate some of his work and some of his responsibility to an assistant. Increase it to 500 and he is bound to have a sizeable staff, and some of them will to a greater or lesser extent come between him and his intimate contacts with his employees. Increase it still further to 5000 and as likely as not the owner is replaced by a board of directors, some of whom will be mere names, or not even that, to most of the employees.

Commercial and industrial techniques are constantly changing and developing, and above all tending more and more to become specialized; the all-round man is tending to disappear from industry. Industry becomes more and more complicated, and it requires more and more study and concentration to master even a small section of it. Under these conditions, the young man tends to concentrate on his chosen section and ignore the rest, or at best to take but a secondary interest; furthermore, he is as a rule not encouraged to "spread" himself.

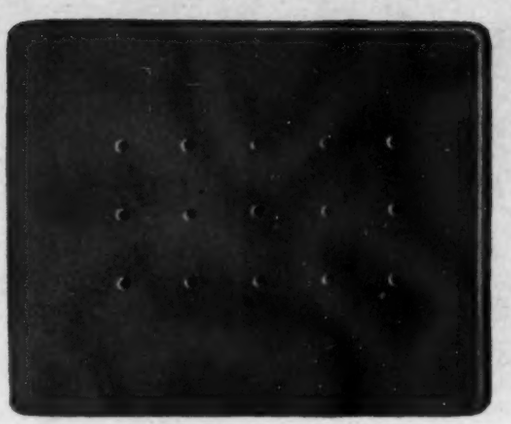
The phrase "silly college boys" betrays the cloven hoof of envy, maybe unconscious, but envy just the same. Here I can speak quite without prejudice, not having been

15 holes in 15 minutes

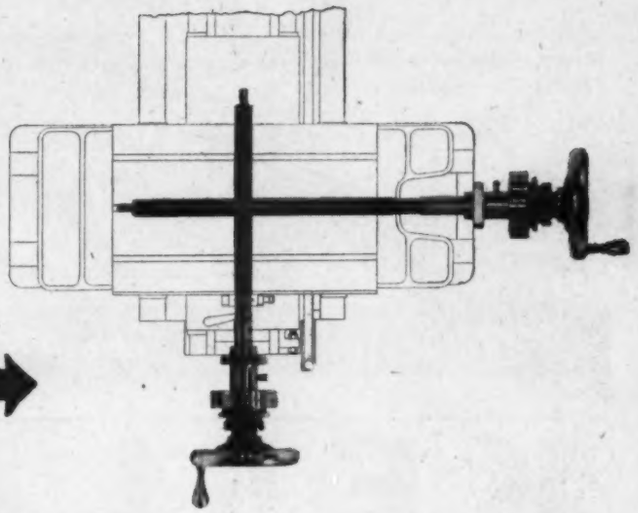
Spotted, Drilled and Reamed to ±.0002″

by the

Coordinate Hole Location Method*



...because
Micrometer Lead Screws
Accurate to
.0002″ in 16 inches



...Speed Table Settings
on the
MOORE JIG BORER

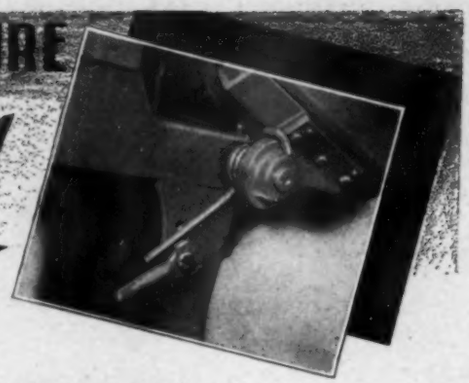
*One boring cut to increase accuracy to ± .0001″ would require only five minutes additional time for all fifteen holes. Write for descriptive literature.

MOORE TOOLS

MOORE JIG BORER

MOORE SPECIAL TOOL CO., INC., 738 Union Avenue, Bridgeport 7, Conn.

BLADE PRESSURE
Positively Controlled

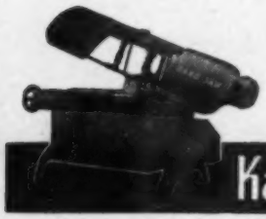


A FEATURE OF THE
KALAMAZOO METAL CUTTING BAND SAW

The adaptability of the Kalamazoo Metal Cutting Band Saw to all types of cut-off jobs is truly amazing. Heavy bars—tubing—hard metals—or soft metals can all be cut rapidly and accurately—as there is an instant adjustment to provide the correct saw blade pressure.

A lever operated cam having five positions is within easy reach to quickly adjust the spring tension to the job. Four holes are also provided to change cam location to compensate for weakening of spring.

Ask your dealer or write direct for complete information.



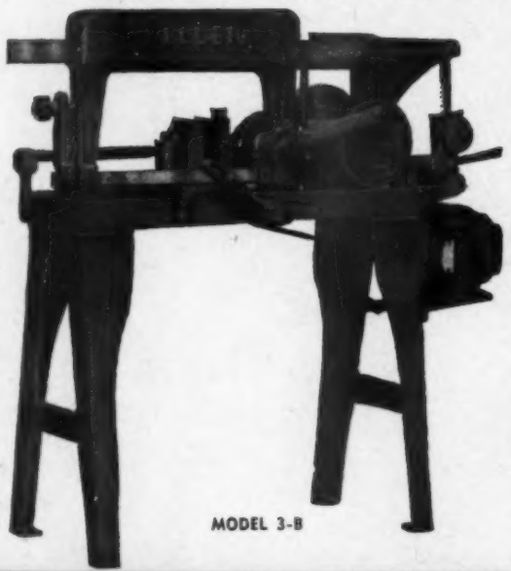
MACHINE TOOL DIVISION
Kalamazoo Tank & Silo Co., Kalamazoo, Michigan
In Canada—BRIDGE MACHINERY CO., *Montreal*

Kalamazoo *Metal Cutting* Band Saw

KELLER
POWER HACK SAWS

CUT CUTTING COSTS

Keller Power Hack Saws are built in several models, priced from $75.00 to $365.00 complete with motors. All models are engineered to handle the maximum quantity of stock, within their capacity, at any desired angle of cut. Choose a model to suit your needs. Write to Dept. A-8 for new catalogue, prices and complete specifications.



MODEL 3-B

Sales Service Machine Tool Co.
2363 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

fortunate enough to have a university education. At the age in question we were ourselves probably just as silly. We may, through our longer and more intimate contacts, have known when a man was "soldiering," but the college kids knew quite a lot that we did not, and if they had the right stuff in them were only too eager to learn what we did.

By all means, let the college boy get down to it for a time and work with his hand, for he will learn a lot besides the job, but don't assume just because he has been to college and you have not, that he is neccessarily any more of a pup than you were at his age.

To sum up, the trend towards specialization and the growth of the complications of industry are bound to lead to a lessening of direct personal contact between "boss" and "worker" and, though in many ways this is to be regretted, there would appear to be no way of avoiding it. Its effects, however, can be palliated by humane and broadminded management.

Old Man Jonas's trouble is that he dislikes the idea that he is not indispensable. One of the most obvious lessons life has to teach is that nobody is indispensible—and it is one of the hardest to learn. Anyone from president to office boy, knows there is somebody just around the corner ready to fill his shoes, and as likely as not, they will fit just as well.

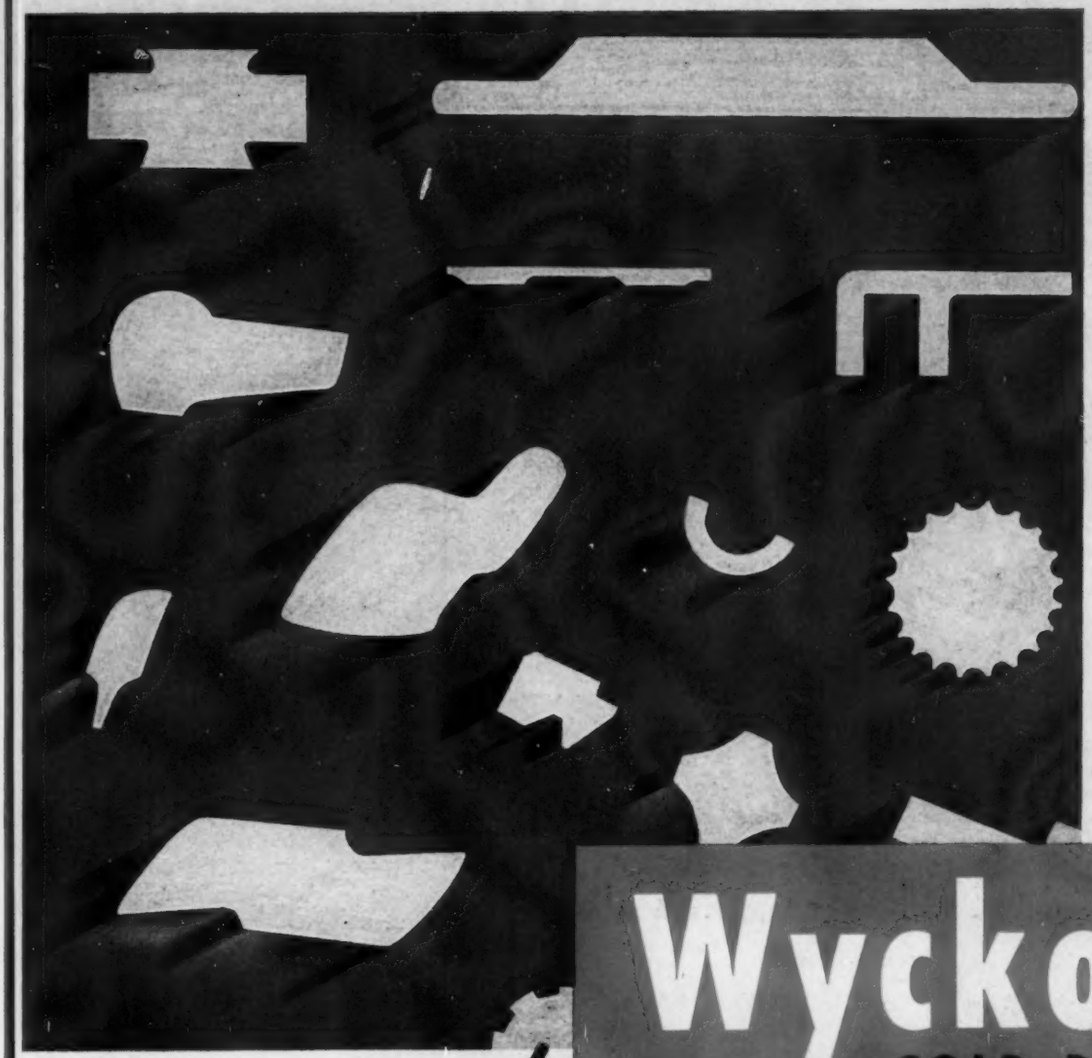
K. N. Harris
Harrow, England

•

CAN THE GRAPEVINE BE KILLED?

Rumors do unsettle men, some men and some rumors more than others, and it is well to keep in mind that it is not unlikely that it is the mentally alert men who most quickly sense possible danger. These men work upon information as does, or in the absence of facts, is thought to exist, and, if the impressions formed are pessimistic in character, they are the more likely to take fright, become unsettled, and look around for other work. If a firm has plenty of orders, actual and prospective, such fears could cause only harm, and it would be wise to remove the cause.

Before any policy of open books is adopted, however, it would be desirable to remember there is a negative side to the picture. What would be the position when the order book was really falling, existing orders were getting worked off and new orders were not coming along? The absence of news, then, could be



Wyckoff
COLD DRAWN SPECIAL SHAPES

half your work is done with...

For products that can be blanked . . . at least half of the machining operations you would otherwise perform in your *own* shop are done for you with WYCKOFF Cold Drawn Special Shapes. You get precision dimensions, form and finish at a fraction of the cost of machining. Your own fabrication is reduced to the minimum in time and cost. Consult WYCKOFF as to the economy of using Special Shapes for your specific cold finished products.

WYCKOFF STEEL COMPANY

First National Bank Building, Pittsburgh 30, Pa.
3200 S. Kedzie Avenue, Chicago 23, Illinois

Works at: Ambridge, Pa.; Chicago, Ill.; Putnam, Conn.; Newark, N. J.

Manufacturers of Carbon and Alloy Steels—Turned and Polished Shafting—Turned and Ground Shafting—Wide Flats up to 12" x 2"

Darnell Casters

A SAVING AT EVERY TURN

DARNELL CORP. LTD.
LONG BEACH 4, CALIFORNIA
60 WALKER ST. NEW YORK 13 N.Y.
36 N. CLINTON CHICAGO 6 ILL.

ominous, although there may be no likelihood of hands being laid off. If orders did not arrive, the situation would have to work itself out. Those men whom it was desired to retain could be assured individually; the position would then be an individual matter for each man. One could soliloquize as did Shakespeare's Hamlet:

"To speak or not to speak; that is the question.
Whether it's better to let Dame Rumor have
Her sway: say naught and risk loss of workmen good
But full of fear or, by giving facts, retain
Them; ignoring prospects of lean times with all
The flood of rumors then unknown, though fraught with
Reason sound; then silence full more ominous;
Yet speech could gender pitfalls deep and all unseen
And lead, mayhap, to deeper problems still.
Speech may silvern be; can silence be of gold?

G. E. Powell
Lincoln, England

•

WHY HELP THE DRUMMER?

The sales engineer, formerly called the drummer, is generally a far different type of individual today than his predecessor in years gone by.

In those days, a smart man, well dressed, with a glib tongue could and did sell a purchasing executive some machines or equipment that, when it arrived in the shop, either was unsuitable for production or did not have sufficient production to warrant the investment—and the machine was idle two-thirds of the time. The same thing happened when buying material.

All this has changed. The vast majority of purchasing agents have to be production-minded, as well as keen bargainers, with a thorough knowledge of the market and the type of equipment that their production department can use. Not only that, but the vast majority of equipment concerns do not wish to persuade any purchasing agent to buy their equipment unless they can guarantee that it will pay for itself in a reasonable period of time.

The sales engineers today have been thoroughly trained. As a general rule, in a large plant they are selected from the machine shop, where they have proved their ability. They are generally first sent out on the road as service men and

TU-MY-CO

TRADE TUMICO MARK

SNAP GAGES

EASY to USE

TU-MI-CO TUBULAR FRAME of special homogeneous grain structure steel is 25 to 50% lighter than solid frame—yet highly shock resistant. Lessens fatigue.

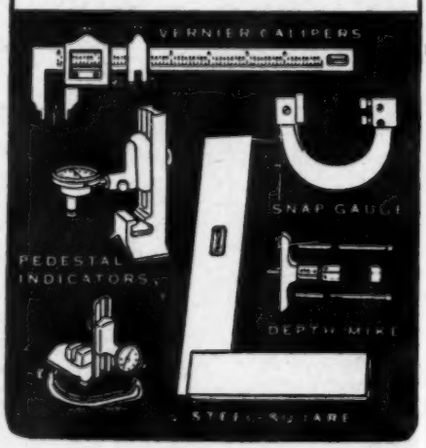
Hermetically sealed, low thermal conductivity, less expansion. Triple plated—copper, nickel and chrome, buffed and polished—an attractive, high quality precision tool.

TU-MI-CO PRODUCTS include a complete line of Micrometers, Pedestal Indicators and Micrometers, Standards, Steel Squares, and other practical measuring instruments. Ask your jobber.

Precision is a TU-MI-CO tradition

WRITE FOR BULLETIN AM-G

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA, U. S. A.
Milwaukee Branch • Plankinton Bldg.

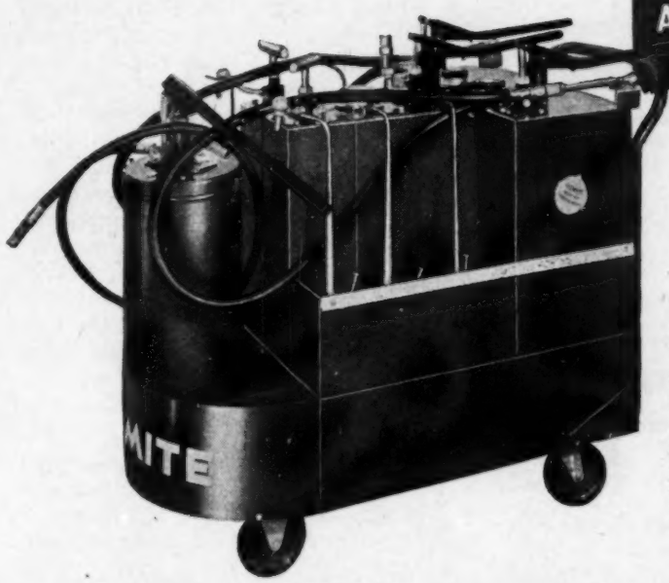


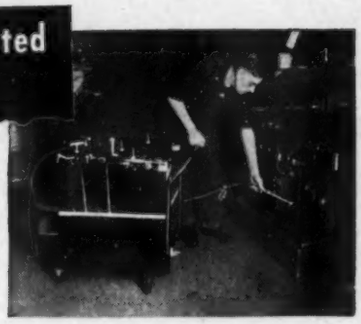
YOUR CHOICE for Immediate Delivery!

COMPLETE LUBRICATION DEPARTMENTS ON WHEELS

Alemite LubriKarts Make the Transferring, Handling and Application of Lubricants a Quick, Clean, Easy Job

Alemite Hand-Operated LUBRIKART





QUICK FACTS

★ Equipped for handling 6 types of greases and oils.

★ Storage capacity for as many as 6 lever-type or push type guns, adapters, tools, waste, etc.

★ Carries 30-lb. capacity high pressure portable grease pump with 5½ ft. hose and hydraulic coupler.

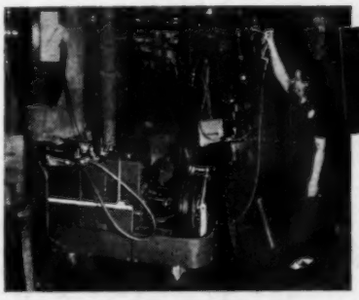
★ Equipped with six 1-quart hand oil cans.

★ Five individually operated grease and oil pumps.

★ Three 7 gallon tanks—two 1¾ gallon tanks.

★ Complete unit, 44″ long x 21″ wide x 37½″ high, wine colored, baked enamel finish.

Alemite Electric-Operated LUBRIKART



QUICK FACTS

★ Equipped for handling 5 types of greases and oils.

★ Added advantage of a built-in, high pressure, electric power gun.

★ 20 ft. high pressure lubricant hose mounted on spring return reel.

★ Comes equipped with six 1-qt. hand oil cans.

★ Four hand operated grease and oil pumps.

★ Two 1¾ gal. and two 7 gal. tanks.

★ Storage capacity for as many as six lever-type or push-type hand guns, adapters, tools, waste or wiping cloths, etc.

★ Complete unit 55¼″ long x 21″ wide x 39″ high, finished in wine baked enamel.

Another Product of STEWART WARNER

ALEMITE

Alemite ALONE Combines all 3 in Lubrication

1. EQUIPMENT 2. PROCEDURES 3. LUBRICANTS

ALEMITE, 1899 Diversey Parkway, Chicago 14, Illinois
Please send me your booklet describing the new Alemite LubriKarts.

Company.....

Name.....

Address.....

City.....State.....

This Simple Shop Instrument

SHOWS

DIMENSIONAL ERRORS

BEFORE THEY OCCUR!

Dimensional errors can be detected *in advance* through a new method of quality control—a proven technique offering tremendous savings wherever parts are produced in quantity by machining operations. Here, in brief, is the story:

When a cutting tool or grinding wheel begins to grow dull, clean cutting action ceases and the metal begins to be torn off. As a result, (1) there is an *increase in surface roughness;* and (2) *dimensional errors* are introduced. Once begun, this effect increases rapidly, frequently leading to defective work before it can be detected by dimensional gaging.

The very *start* of poor cutting action is indicated by an *increase in surface roughness* somewhere along the work. This "starting-point" is quickly determined by taking Profilometer readings, *right on the production line* or even in the machine. Impending dimensional errors are thus detected *before they occur,* and consequently are easily prevented.

The Profilometer gives a direct meter reading of surface roughness in microinches. It can be used on practically any surface that can be produced by normal machining or grinding methods. Used for predetermining errors as described above, its initial cost is soon repaid by savings in production time and elimination of rejects; and that is only one of its applications.

May we send you descriptive literature?

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PHYSICISTS RESEARCH COMPANY

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trouble shooters. Then, if they make good, when a sales position is open they are given the opportunity of trying their hand at it. It is a sales engineer's business to pass on any helpful information he can and to help increase the production of any company with whom he has dealings.

Many years ago I called repeatedly on a concern that I felt ought to be one of my best prospects. I could never get anywhere with their purchasing officer. On every call he would say that he didn't have any operation for my machine.

One day I called when he was on vacation and talked to a pleasant young man substituting for him. When I informed him of my business and showed him pictures of the type of machine I was selling, he suggested I talk to the chief engineer. He in turn studied them and then took me out to the production shop. They had the ideal product for which one of the large type machines was designed. The superintendent was called, who agreed that the machine looked good to him. I suggested they mail three dozen samples of pieces to be put through the machine at our plant. This was done, and they were returned in a week, along with a time-study taken. Ten days later we received an order.

The machine was installed and boosted production, plus cutting cost in time. It resulted in a man and a helper producing six times as much work as was formerly produced by six men and two helpers.

With regard to allowing salesmen to go around the plant selling tools to workmen, I believe Ed is right that it is not a wise thing to do. It wastes the time of the employees while the displaying and the selling is going on. A better way is to have a show case where tools can be displayed by the vendors. Catalogues of tools of nearly every description can generally be obtained from shop stores. A choice of tool can be made and ordered by the storekeeper, and the cost can be deducted from the man's pay envelope. Another way would be to arrange for the salesman to display any tools or other products that he believes the men may be interested in buying in the noon hour or work cafeteria.

The majority of shop men are under the impression that the drummer has an easy living, coupled with a high salary—a fact which was true years ago. In most cases, today, their earnings are low compared to those of the highly skilled mechanic.

Arthur Silvester
Oakdale, Conn.

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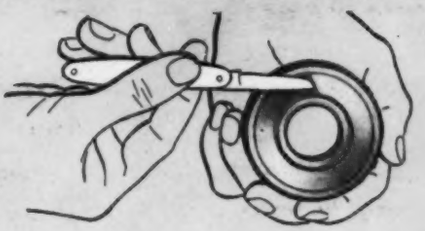

It's a bearing you can open for inspection or relubrication ...and seal again

It's the biggest ball bearing improvement in 20 years .....

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● **Tightest seal ever devised** ... Synthetic rubber washer, locked in groove of outer ring by split retaining ring of spring steel, makes perfect contact with inner ring. Self-adjusting because pressure is constant. Absolutely non-capillary.

No distortion of rings ... Pliable, self-adjusting character of this seal removes all possibility of out-of-roundness sometimes produced by rigid type seals.

Practically indestructible ... Plya-Seal is unaffected by extreme temperatures up to 175°F. and beyond or down among the sub-zeros. Most ball bearing contaminants are effectively excluded. Plya-Seals in service over 5 years are still good as new. The synthetic rubber washer does not age.

Yet you can remove the PLYA-SEAL with a penknife and replace it just as easily, just as tightly ... and you can remove and replace it as often as necessary for inspection and relubrication without reducing its efficiency in the least.

Because it's no wider than a standard unsealed ball bearing the Fafnir PLYA-SEAL offers an opportunity to add a big plus to your present machines and equipment without machining or redesigning costs. Ask your Fafnir representative to show you PLYA-SEAL, or write for full information. The Fafnir Bearing Company, New Britain, Connecticut.

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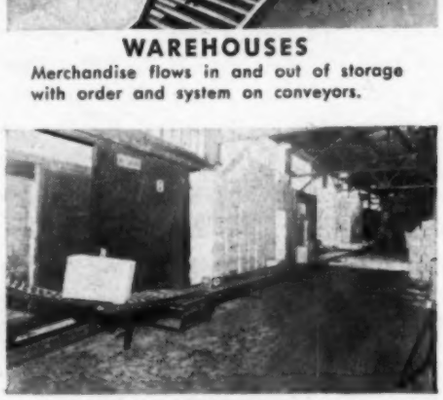

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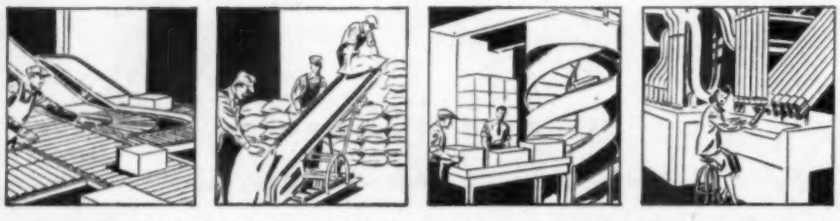

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NEW BOOKS

HOW TO SUPERVISE PEOPLE—*By Alfred M. Cooper. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 162 pages. Price $2.*

Now in its second edition, this book, first published in 1941, has been brought up-to-date by text revisions throughout and addition of a chapter on the supervisor's responsibility for improving his company's public relations.

Written by a man having wide experience in conducting conferences on supervisory training, the book is intended as a guide to those having the responsibility of managing men as well as to those aspiring to supervisory positions. To the latter, the first chapter offers practical suggestions on how to become a supervisor. Boiled down to its essentials, it advises hard work, loyalty and display of common sense.

From there on, the book gives ideas, just as practical and workable, on handling responsibilities, welfare of subordinates, development of group morale, cooperation, personnel problems, delegation of authority and duties as a teacher.

Problems met with in everyday supervision are discussed—from handling situations where an employee might be impairing his work by out-of-plant habits to those developed by short-circuiting of subordinate supervisors by executives. To adapt the book as a text for conference groups, similar problems are presented for discussion.

•

DICTIONARY OF MACHINE SHOP TERMS —*By Arthur C. Telford, Instructor in Machine Shop Practice at The William Hood Dunwoody Industrial Institute of Minneapolis. Published by American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill. 292 pages. $0.75.*

A pocket-book, handy for quick reference on the job, this dictionary contains thousands of terms used in machine shops and related shops. The definitions are brief and in the language of the trade.

The primary aim of the publication is to help the beginner understand directions and suggestions from foremen and other trainers. Time is saved when new terms are encountered and the beginner is requested to refer to the book.

No. 73 of a Series of Typical Installations

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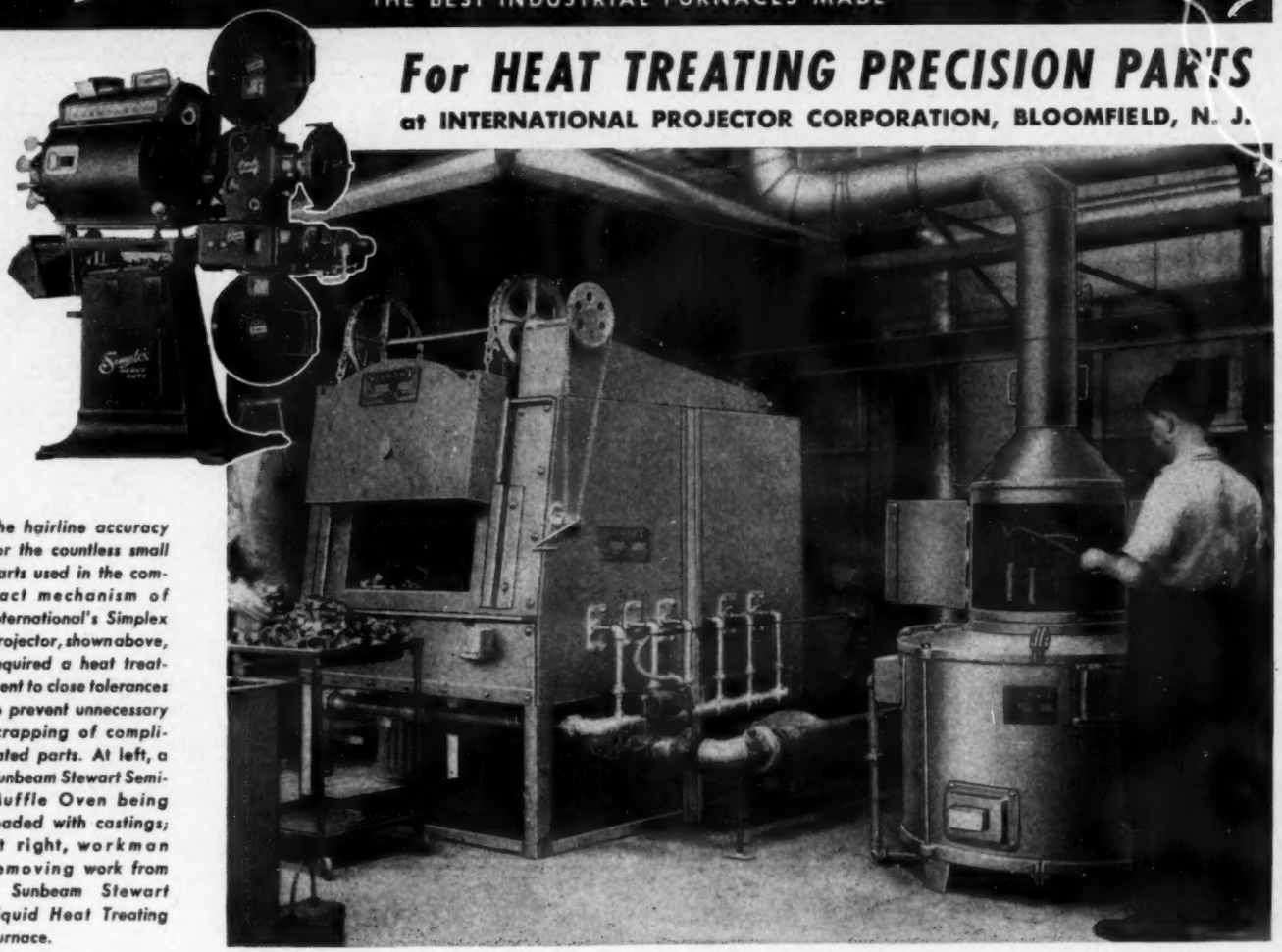
STEWART
THE BEST INDUSTRIAL FURNACES MADE

For HEAT TREATING PRECISION PARTS
at INTERNATIONAL PROJECTOR CORPORATION, BLOOMFIELD, N. J.



The hairline accuracy for the countless small parts used in the compact mechanism of International's Simplex Projector, shown above, required a heat treatment to close tolerances to prevent unnecessary scrapping of complicated parts. At left, a Sunbeam Stewart Semi-Muffle Oven being loaded with castings; at right, workman removing work from a Sunbeam Stewart Liquid Heat Treating Furnace.

One example of the close tolerances that must be met in the manufacture of the Simplex Projector is the "star wheel" that provides the movement of the projector. This critical part is held to *.005" after heat treatment before grinding.* For the exacting heat treating requirements of the countless small parts used in their compact mechanism, International Projector uses *standard* Sunbeam Stewart equipment throughout for normalizing, stress relieving, and high-speed tool steel heat treating.

Two Sunbeam Stewart Semi-Muffle Oven Furnaces and Two Round Pot Furnaces, one used for hardening, the other for tempering, enable International Projector to do work that formerly was sent out to commercial heat treaters. With the installation of this equipment, the quality and uniformity of work was held to International's close requirements.

This installation is typical of the standard industrial heat-treating furnaces Sunbeam Stewart builds every day to meet the requirements of manufacturers all over the country. Sunbeam Stewart engineers will be glad to work with you on your heat treating requirements.

FREE ON REQUEST
SUNBEAM STEWART VEST POCKET HEAT TREATING DATA BOOK
Seventy-two pages of charts, tables, diagrams, factual data . . . . ready reference book for all types of engineers. Write Sunbeam Stewart, Dept. 119 for your personal copy.

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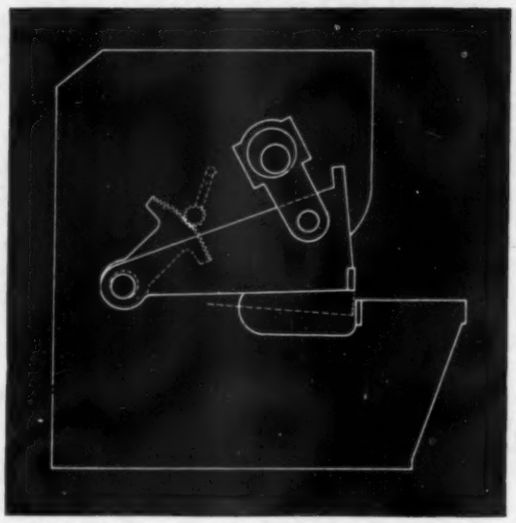
NO OTHER SHEARS ARE LIKE STEELWELD

RADICALLY DIFFERENT WITH REVOLUTIONARY FEATUR

Users from coast to coast are acclaiming the merits of Steelweld Shears. These power-driven metal-cutting machines are different from all other shears on the market. They represent the greatest advancement in shear design in decades.



A revolutionary pivoted-blade principle is employed that makes possible several outstanding advantages and overcomes certain handicaps of present-day guillotine type shears. There are no slides and guides to wear out of true and cause inaccuracies. The upper blade operates on two heavy pivot pins secured to the end housings and travels in a circular p

The knife clearance is e adjusted to suit the plate th ness by turning a conve hand crank. A large dial i cator shows the thickness may be cut for any knife set

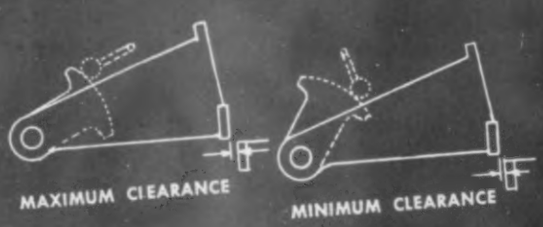
A complete line of Steelw Shears has been developed cutting plate of all thickn from 12 gauge to 1¼ inch for lengths of 6 feet to 18 feet. They ma arranged for squaring, slitting and notch Speeds range from 60 strokes per minute on smaller sizes to 25 strokes per minute on largest shear.

3 Outstanding Features

1 UPPER KNIFE TRAVELS IN CIRCULAR PATH

Blade turns on pivot pins. No guides and slides, as in guillotine-type shears, to wear and cause inaccuracies. Upper knife swings away from lower one, increasing distance "A" from back gauge to stationary knife, thereby permitting sheared pieces to drop freely without binding.

2 FAST KNIFE ADJUSTMENT



Knife clearance easily and quickly made to suit every plate thickness. No bolts to loosen; no parts to move. It is only a matter of turning a crank and watching the indicator which indicates the clearance in thousands of an inch and also shows the plate thickness that may be cut for any knife setting.

3 COUNTERACTING SHEAR PRESSURE

The shearing force is so applied a its horizontal component "A" will e proximately equal and counteract pr ure "B" that develops in the kni during shearing, tending to sp them apart. This reduces the load the blade pivot pins to a negligi amount and assures long trouble- life at these points.

16 IMPORTANT ADVANTAGES

1. Knife clearance easily adjusted to suit plate thickness.
2. Smooth, clean cuts.
3. Accurate, straight and true edges.
4. Easy and simple to operate.
5. Fast cutting and high production.
6. Convenient electric foot control.
7. No slides or guides to wear.
8. Trouble-free mechanical hold-downs.
9. Easily arranged for squaring, slitting or notching.
10. Convenient back gauge.
11. Negligible twist, camber and bow in cut pieces.
12. Quiet operating.
13. Designed for safety throughout.
14. Long knife wear between grindings.
15. Knives easily removed or replaced.
16. All-welded one-piece frame with bed integral.

...weld Shears are of all-...d steel construction. Bed is ...al part of frame. This ma-... (Model No. 410) cuts ...up to ⅜" x 10'-0".

Turning this convenient crank changes the knife clearance. The indicator shows plate thickness that may be cut for any knife setting.

Electric foot switch operation is a standard feature on all Steelweld Shears. Easily operated by toe action, the switch can be slid around the floor to wherever most convenient.

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Catalog No. 2011 gives details.

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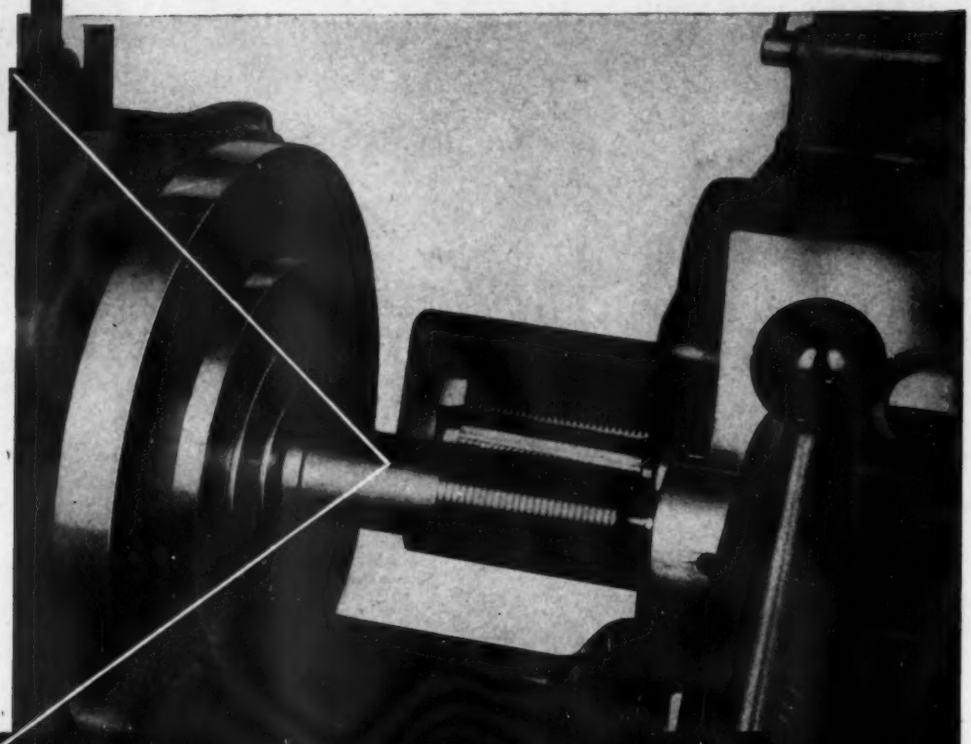

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In these days of rising costs, Hanson-Whitney is leading the way to more economical thread production . . . to simplified set-up and operation . . . with the very latest thread milling equipment. Internal or external threads; right or left hand threads; straight or tapered threads are produced automatically in one revolution with a multiple thread milling cutter. That means more volume in a given time . . . less time on a given job. Whether you handle small lot or mass production jobs, Hanson-Whitney engineers can show you how to realize direct savings from lower equipment costs, from reduced maintenance and from lower labor costs. For further information, write: The Hanson-Whitney Machine Company, Hartford, Conn.

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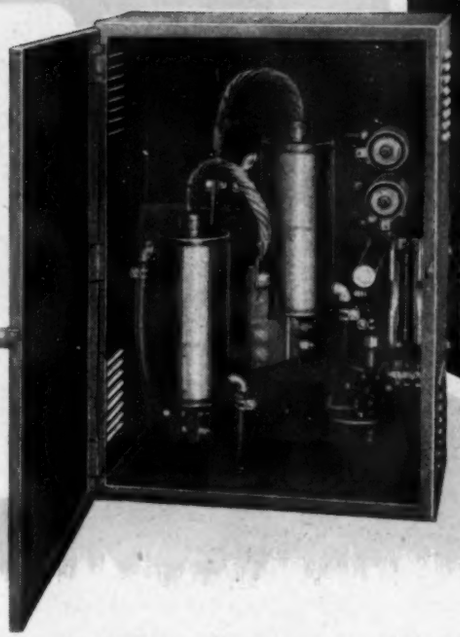

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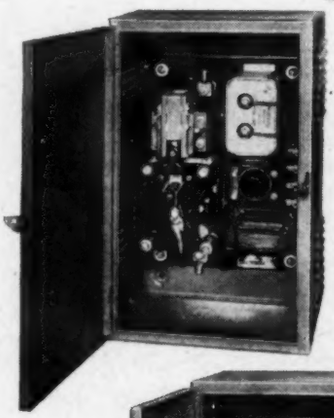
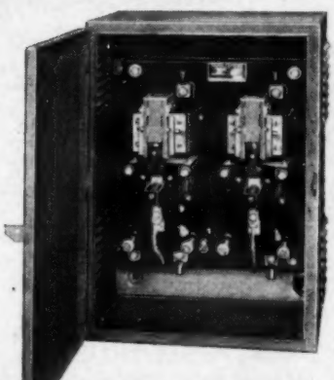


With Three Complete Lines Square D has the right contactor for each resistance welding job

Electronic contactors for jobs involving heat control, very short weld periods at heavy currents, or exceptionally high speed operation.

SYNCRO-BREAK contactors for production jobs where lower installed cost and economical operation are important. Especially desirable where welders must operate over a wide range of weld times and duty cycles. Synchronizing feature eliminates arcing and prolongs contact tip life.



HIGH SPEED contactors, single or two-pole, for greatest economy on jobs where loads are smaller and duty cycles less severe. Designed specially for welder service, with knife-edge bearings, low-inertia moving parts and powerful blowout coils.

Write for BULLETIN 8990, describing all three lines of contactors. Square D Company, 4041 North Richards St., Milwaukee 12, Wisconsin.

Square D builds *Safront* weld and sequence timers suitable for use with any of the three contactor designs. Write for BULLETIN 8991.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

Cost of machine frame reduced 50% by change to welded design

BY LOUIS FAULB, PRESIDENT
KLEEN-KUT MANUFACTURING COMPANY
CLEVELAND, OHIO

Production cost of the frame of the Kleen-Kut meat saw manufactured by our company has been reduced more than 50% by redesigning it for fabrication by arc welding. The former design and the latest welded design are shown in Fig. 1.

The new design has reduced machining operations 60%, has made the machine six times as rigid, cut its weight from 550 to 350 pounds, and has doubled the production output of the same floor area.

The changeover to all-welded design was an evolutionary process over an 18-month period.

We started with the table frame shown in Fig. 3, and the cost reduction encouraged us to redesign the whole machine. Since our original all-welded design, we have made 40 improvements. If we had used conventional fabricating methods, 40 modifications or complete changes in patterns would have been necessary. Open views of the original welded design and the latest welded design are shown in Fig. 2.

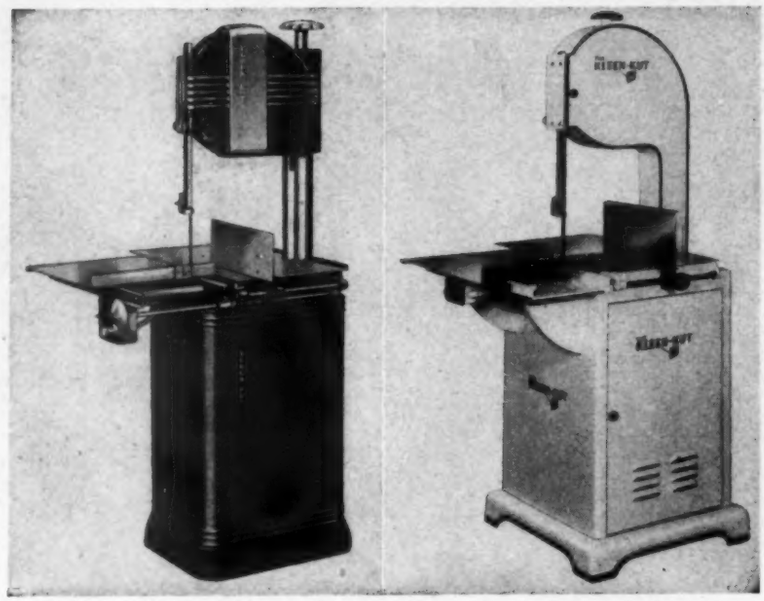


Fig. 1. Saw of former conventional design (left) and all-welded design (right).

IMPROVES THE PRODUCT

Welded design has increased the saw's overall rigidity and strength. The top pulley support, subject to considerable stresses, was stiffened by simply welding a 32-inch length of angle vertically inside the housing. Rigidity was further aided by widening the main frame to the full length of the base and redesigning the door.

Adjusting the saw blade tension in the former model required moving the entire head of the unit up or down, which took too much time. In the new design this adjustment is made by simply turning a rod. To incorporate this feature in the former design would have meant an excessive amount of machining.

INTERMITTENT WELDS USED

The new saw frame is made largely of formed plates, reinforced at strategic stress points with gussets and cross-braces. A minimum of material and welding is used, most parts being fused with intermittent welds like those in the table frame (Fig. 3). This type of welding obtains proper strength, avoids distortion and speeds production.

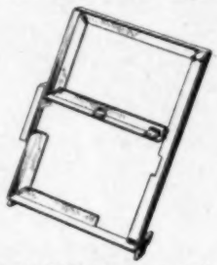


Fig. 3. Table frame, made from angles. This is the first part that was changed to welded design.

The table frame is constructed of 1½-inch angles with ½-inch bearing brace. The machine base consists of four ¼-inch plates joined by fillet welds in open corner joints. The main stand is 3/16-inch-thick steel sheet with inside fillet joints. Bearing and pin bosses are solid welded into the structure. Hinged covers are 14 gauge steel sheet.

Wherever possible, welding is done on the inside of the joint to give a smooth exterior appearance. Because materials are light-weight, all parts can be easily handled for bench-welding.

The reduction in machining operations has enabled us to double our production within the same floor area. Materials-procurement has also been simplified. Previously we ordered parts from seven outside firms; now we make them all in our own plant with simple, low-cost production facilities.

In approaching redesigning problems, our engineers have been aided by the Studies in Machine Design issued periodically by The Lincoln Electric Company. These are available free to engineers and designers who write The Lincoln Electric Company, Dept. 213, Cleveland 1, Ohio.

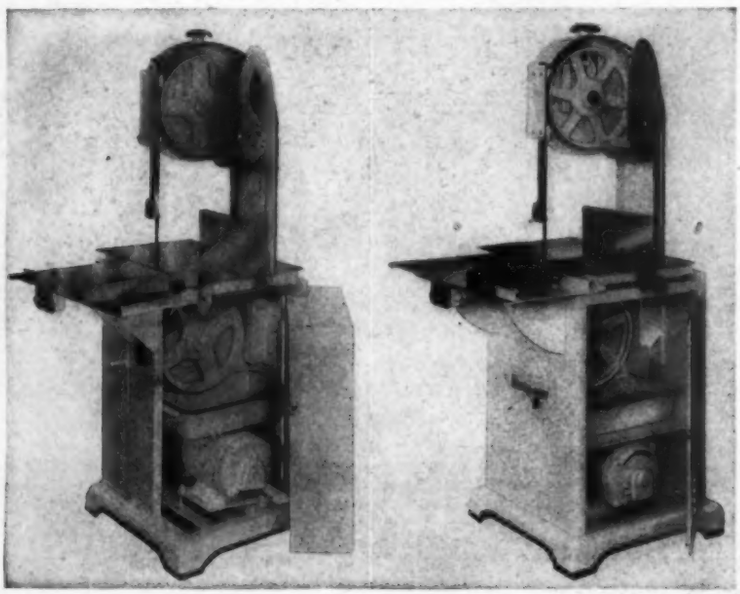


Fig. 2. Original welded design (left) and latest welded design (right) with covers open to show interiors.

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SEALS BOTH ENDS OF LINE—
AUTOMATICALLY...INSTANTANEOUSLY

The new Hansen two-way shut-off coupling provides for easy—quick—safe connecting and disconnecting of hydraulic and pneumatic lines. This unique "spool type" valve coupling permits the instant sealing of each end of the lines immediately upon disconnection of plug from socket. To connect, you pull back sleeve and merely push plug into socket—coupling is connected and locked—valves in socket and plug are open, automatically permitting oil or gas to flow freely in either direction. To disconnect, push back sleeve — this disconnects coupling. Socket and plug are each positively sealed, automatically preventing loss or spillage of fluid. Check the many advantages in time, labor and cost savings provided in this new Hansen two-way shut-off coupling.

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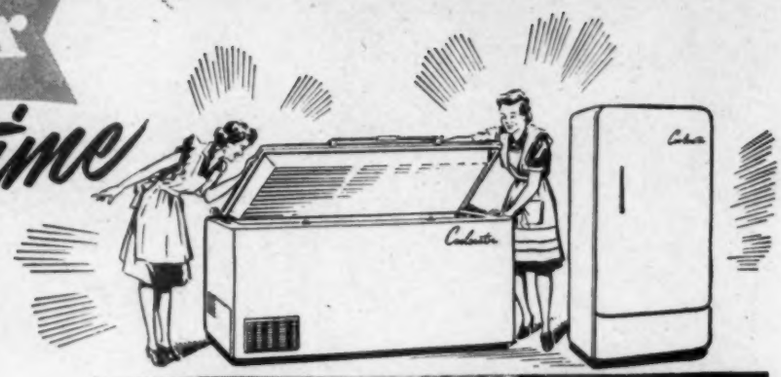
Coolerator saves costly time Training New Assembly Workers by using PHILLIPS SCREWS



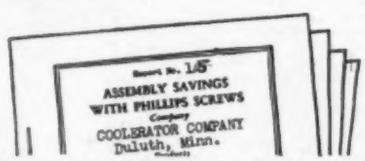
Highlights from a comprehensive report by independent investigator of James O. Peck Co.—one of their studies of assembly savings made with Phillips Screws in leading plants . . .

● "WE made an important saving we hadn't counted on when we switched to Phillips Recessed Head Screws," said the foreman of Coolerator's assembly line. "Instead of the expensively long period usually required to train operators to drive slotted screws, we found that new people could start driving Phillips Screws with a few simple instructions. Since we use about 125 Phillips Screws in every Coolerator and our daily production is 800, there isn't much time for teaching anyone how to drive a screw.

"EASIER TO USE, especially in awkward or blind applications . . . like fastening the black base to the bottom of the unit or attaching the ice container to the box. You have practically no control over slotted screws, while Phillips Screws are easy to line up.

"STOPPED PANEL DAMAGE and burring of heads. Assembly people used to almost write their names on the sides of the units when a slotted screw driver slipped. That cost real money . . . for disassembly, refinishing and reassembly, not to mention the disruption of the assembly line. Phillips Screws ended slips.

THE WHOLE STORY of this and other assembly studies in key plants . . . covering metal, wood and plastic products . . . will suggest similar savings to any production man. This coupon will bring you these reports—FREE. Mail it now.



Phillips Screw Mfrs., c/o Horton-Noyes
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Send me reports on Assembly Savings with Phillips Screws.

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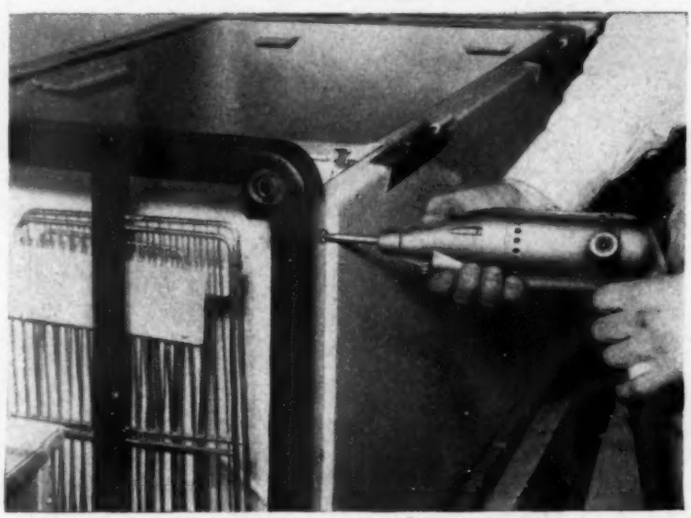
A.M. 16

Here's a tricky bit of "blind" driving . . . through a small hole in the ice unit. With Phillips Screws, locating and driving is easier.



If ordinary slotted screws were used in fastening this black enameled base, inevitable driver slippage would do costly damage to the adjacent panels.

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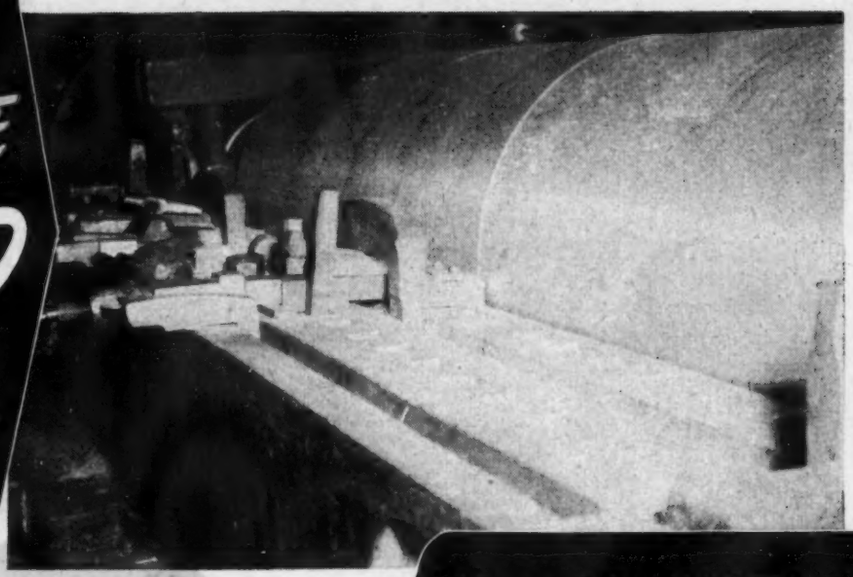
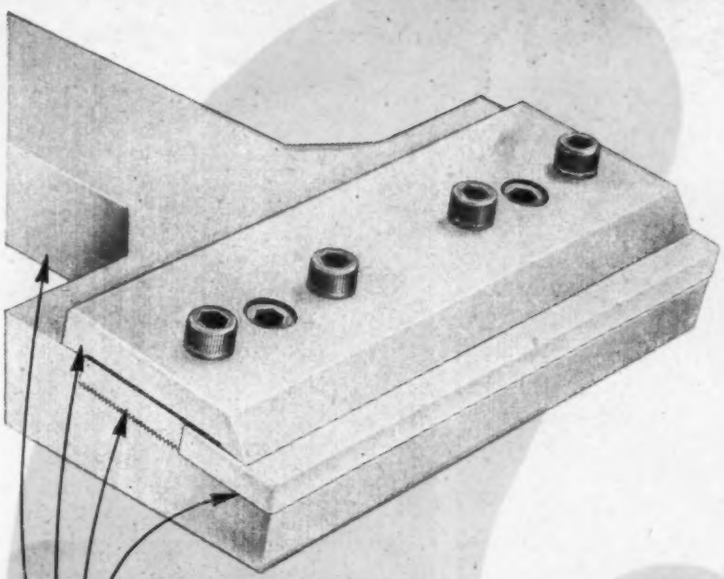
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wolverine Bolt Company

NOW THEY CAN BE TURNED

*and at Far Less Cost**





"UNMACHINABLE" CHILLED CAST-IRON ROLLS

[UP TO 90 SCLEROSCOPE]

CAN NOW BE TURNED with the NEW

KENNAMETAL ROLL-TURNING TOOL

- Rugged, solid Kennametal Blade . . . hard, strong Grade K6; clamped-in, advanceable, four cutting edges.
- Shank, clamp, and back-up plate are heat-treated steel.

Cataloged in four standard sizes — cutting widths of blades: 4", 6", 8", and 10". Other sizes can be made on special order.

Turning chilled cast-iron rolls costs far less than the traditional process of grinding—and here's the tool that can turn even "unmachinable" castings—up to 90 Scleroscope . . .

A sturdy Kennametal Grade K6 blade is securely held in place on an accurate surface of the supporting shank by a clamp and serrated, advanceable back-up plate—each of hardened steel.

The blade has four cutting edges that may be used in succession before any sharpening is required. Then it can be reground time and again (long sides only) and advanced each time to cutting position, until ⅔ of it has been utilized.

There's one positive way to prove this new Kennametal tool can greatly reduce your cast-iron roll production costs—and that's under actual working conditions in your shop. We'll demonstrate—invite us.

*For example, a roll that required 25 hours for rough grinding was turned with two 8" Kennametal Tools in 8½ hours.

TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL

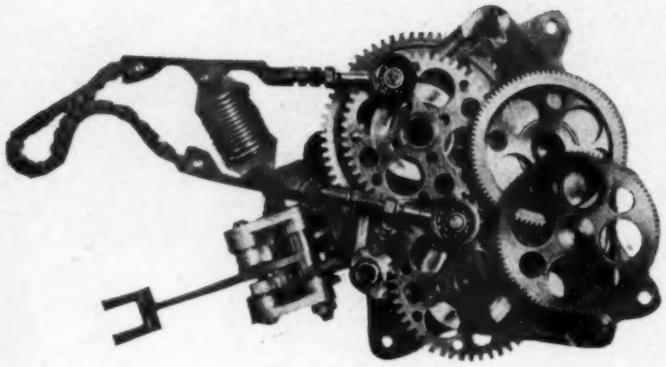
SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

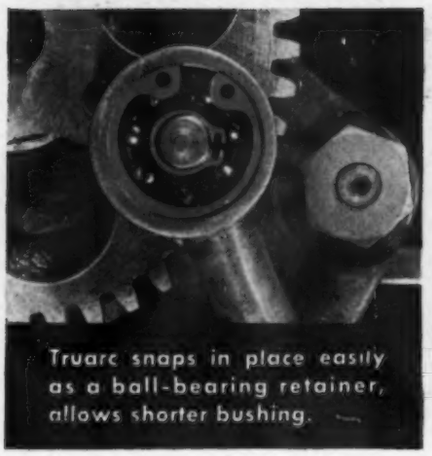
36 TRUARC rings reduce weight, eliminate

• Waldes Truarc retaining rings cut machining, assembly, maintenance time

Tiny rings easily installed keep link pins in position, are easily removed for repairs.

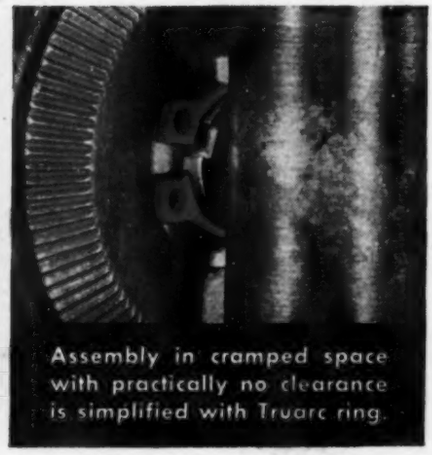


Courtesy of Dalmo-Victor



Truarc snaps in place easily as a ball-bearing retainer, allows shorter bushing.

Gears stay secure: Truarc saves space in this gear and worm application.



Assembly in cramped space with practically no clearance is simplified with Truarc ring.

"TRUARC NOT ONLY REDUCES WEIGHT IN OUR APS-4 AIRCRAFT ANTENNA," states Dalmo-Victor, of San Carlos, California, "but also saves numerous machining, drilling and threading operations and reduces assembly and maintenance time. Waldes Truarc Retaining Rings are easy to install and remove, give equal pressure over a continuous surface because of their perfect circularity, and eliminate large numbers of tools hitherto required. They do not deteriorate under the most rigorous operating conditions."

parts in complex radar aircraft antenna!

Wherever permanent maintenance of tolerance is important, Truarc rings keep moving parts in accurate relationship. In all industries, designers find Truarc a better way of fastening machine parts; production and maintenance men find Truarc cuts costs.

There are different Truarc rings for any need, in a complete range of sizes, for internal or external use. For example, there are Truarc rings that can be applied radially where axial assembly is impossible. Another type of ring is designed to take up end-play. Whatever your specifications, there's a Truarc ring that will do your fastening job better than screws, bolts, machined shoulders or cotter pins. Waldes Truarc engineers will be glad to assist in solving your problems. Send us your drawings; see how Truarc can help you.

INTERLOCKING . . . 2-piece ring takes heavy thrusts, gives positive lock against high RPMs.

CRESCENT*: Snaps on radially where axial assembly is impossible. No special tools are required.

SELF-LOCKING: Economical where thrust is moderate—holds fast, yet shaft requires no machining.

INVERTED . . . Gives uniform shoulder for curved surfaces, for bearings with large corner radii.

BEVELED & BOWED: Takes up end-play rigidly or resiliently, accommodates accumulated tolerances.

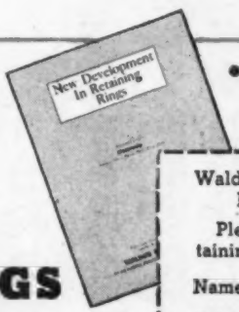
E-RING: Variant of Crescent for small shafts; provides large, strong shoulder. Easily removed.

WALDES TRUARC

U. S. PATENT RE. 19,144 AND OTHER PATS. PEND.

RETAINING RINGS

WALDES KOHINOOR, INC., Long Island City 1, New York



● *Send for New Truarc booklet, "New Development in Retaining Rings"*

Waldes Kohinoor, Inc., 47-10 Austel Place 12-14
Long Island City 1, N. Y.

Please send booklet, "New Development In Retaining Rings" to:

Name_____

Title_____

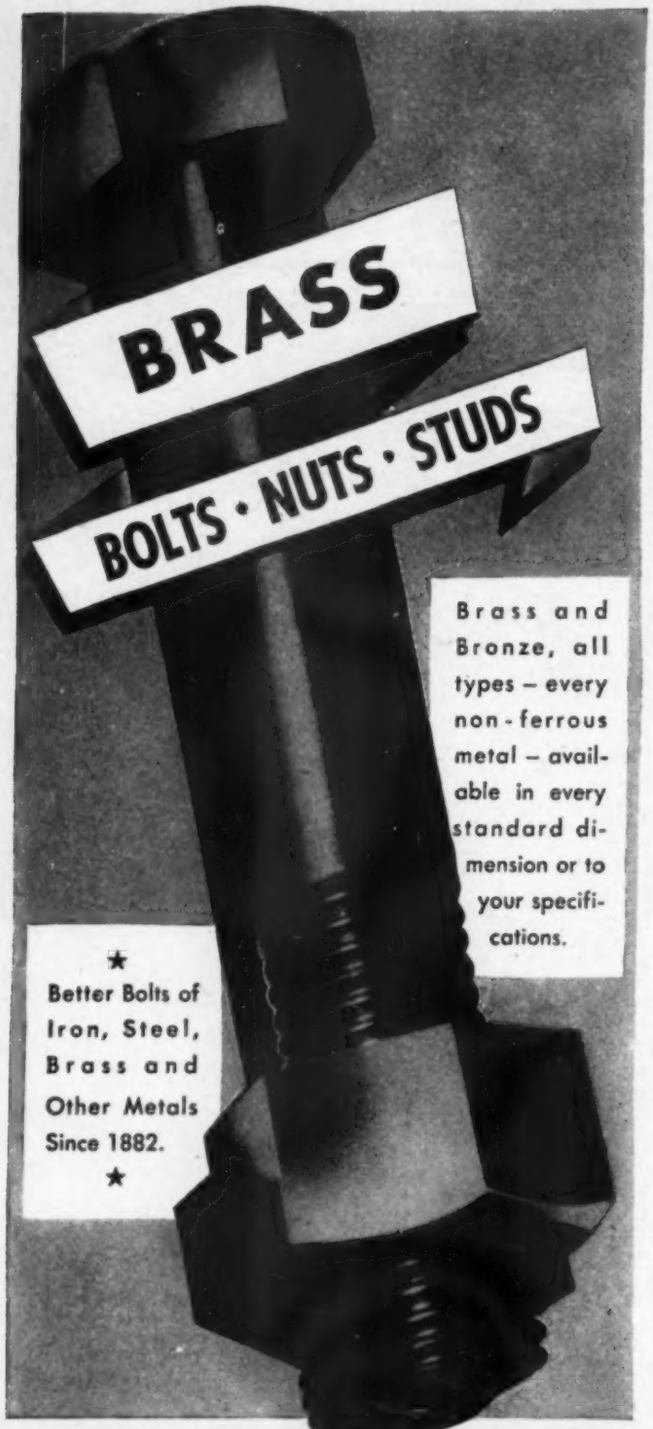
Company_____

Business Address_____

City_____ Zone____ State_____

*U.S. Patent 2,382,948

USE HEADED AND THREADED FASTENERS FOR ECONOMY AND RELIABILITY


BRASS
BOLTS • NUTS • STUDS
Brass and Bronze, all types – every non-ferrous metal – available in every standard dimension or to your specifications.
★ Better Bolts of Iron, Steel, Brass and Other Metals Since 1882. ★

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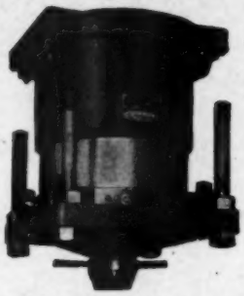
327 Pine Street • Pawtucket, R. I.

"THE BOLT MAN"

THE PLACE TO SOLVE YOUR BOLT PROBLEMS

+ INCREASED PRODUCTION
— REDUCED SETUP TIME
= DAYTON ROGERS DIE CUSHIONS



No matter how you figure it Dayton Rogers Die Cushions will assure better results and lower production costs on your punch press operations because:

1. They are readily adapted to either short run quantity requirements or for large quantity production.
2. They automatically convert a press from single action to double action for deep drawing work.
3. Correct pressure pad control on forming dies obtained quickly by simply adjusting the pressure regulator.
4. They afford positive stripping action on all compound, blanking and piercing dies.

Write for illustrated, engineering catalog #100-1

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7, MINN.

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Cutting to length, Heat treating, Forging. Testing, Turning, Special Finishes. Prompt shipment of rounds, squares, flats, hexagons, octagons, and billets. Technical information and recommendations.

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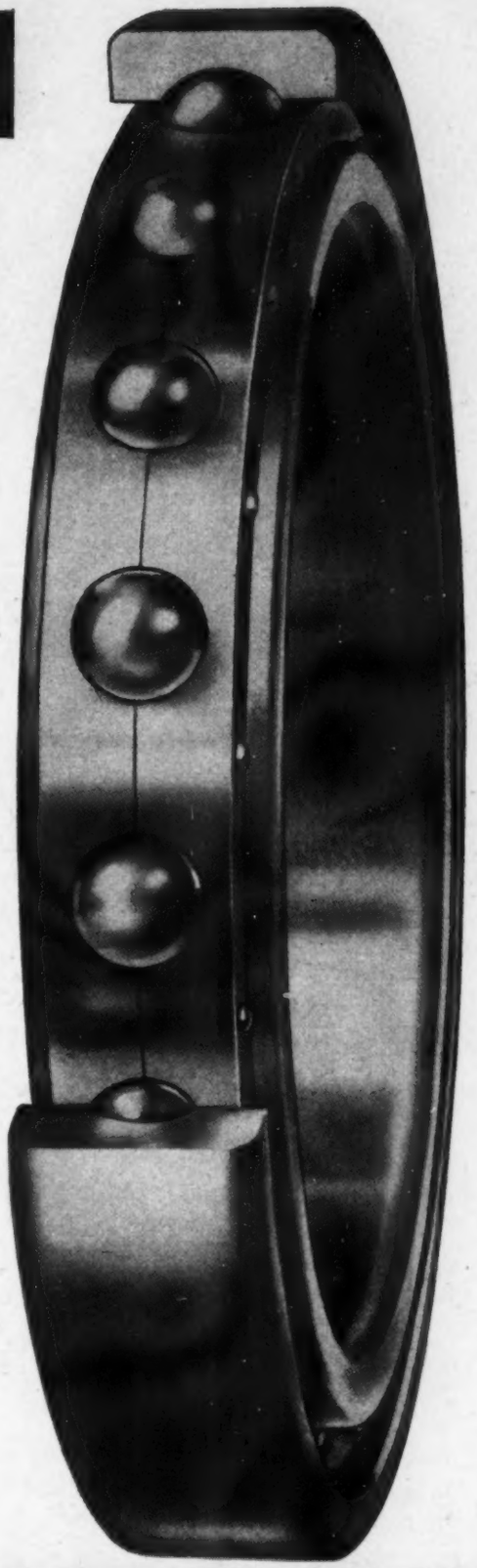
5

NORMA-HOFFMANN'S

Extra Light Ball Bearing



"XLS" Series Aids Designers Where Space is Limited

In many cases where friction-free operation must be had in extremely restricted space, these Extra Light Ball Bearings by Norma-Hoffmann have been the only solution. The "XLS" Series (in bore sizes below 1¾" called the "S" Series) provides a range from ⅛" to 22½" bore. These bearings are self-contained, non-separable and are suitable for combined radial and thrust loads in either direction. They are made to inch dimensions.

FEATURES

1 Have unusually large bore compared to outside diameter.
2 Are compact, light in weight.
3 Allow greater latitude in design.
4 Provide utmost in accuracy, rigidity, load capacity and friction-free operation.

NORMA-HOFFMANN Precision BEARINGS

NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD, CONNECTICUT
FIELD OFFICES: New York, Chicago, Cleveland, Detroit, Pittsburgh, Cincinnati, Los Angeles, San Francisco, Seattle, Phoenix

SINGLE OR TWIN BUTTON CONTROL STATIONS

Master's exclusive *single button control* is obtainable either integral with the starter or in a remote control station (left). Only one push button—one set of control contacts—no auxiliary contacts in starter. The visual mechanical signal gives unfailing "ON" or "OFF" indication: no bulbs to burn out or replace. . . . When multiple remote control of a single starter is required, Master furnishes conventional two-button remote stations (right).

Master Offers Both

Yes, Master gives you many more good practical advantages built into A.C. across-the-line, magnetic motor starters. For example:

All contacts are readily removable from the front. Moving contacts are double-faced for double life.

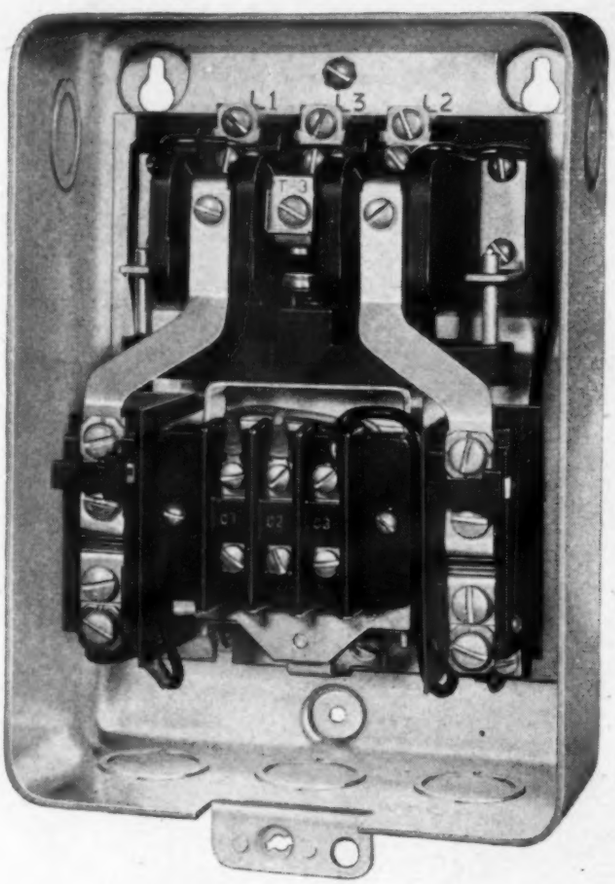
Jumpers, heavy formed straps instead of flexible wires, add rigidity to the contact assembly.

You can connect remote stations readily—without guesswork—to the plainly marked terminal board in front of the solenoid.

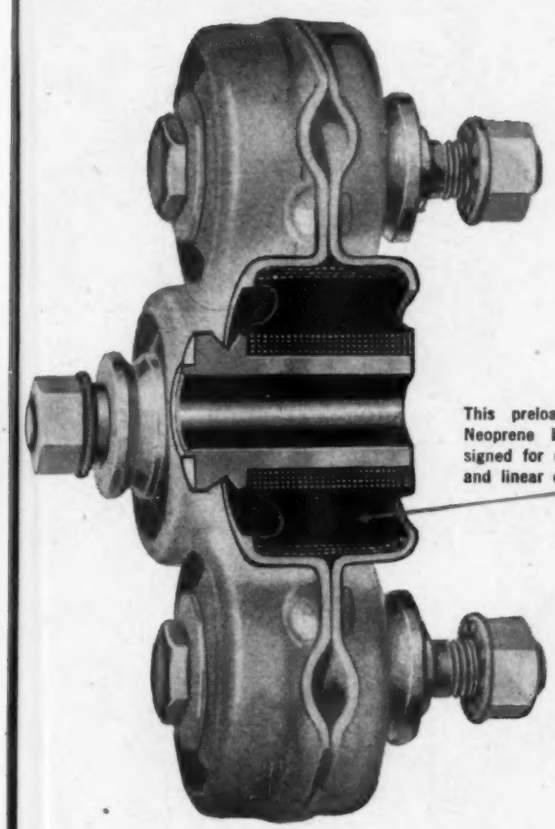
Heaters are accessible from the front: you can install them in next to no time.

Knockouts? Plenty. Wiring space? Ample. Styling? Modern in every detail.

One thing more: these controls bear a name long famous on motors. You can trust it, too, on motor controls. Write for bulletin 200.



THE MASTER ELECTRIC CO. MASTER **DAYTON 1, OHIO**



This preloaded, resilient Neoprene biscuit is designed for uniform stress and linear deflection.

Morflex Couplings have *LIVE* Torsional Resilience

By live, muscle-like flexing, Morse's exclusively designed Neoprene biscuit assembly shields machine installations from shock and uneven impulses. Through its torsional resilience (softness) Morflex takes the wrap-up. Misalignment stresses are minimized, resulting in longer bearing life. Address application problems to our Detroit office.

MORSE CHAIN COMPANY • Detroit 8, Mich. • Ithaca, N.Y.

MORSE MECHANICAL POWER TRANSMISSION PRODUCTS

A PRODUCT OF B-W BORG-WARNER

UPPING PRODUCTION by 50%

. . . Accuracy to ±.0005" at Cincinnati Bickford

New Bullard MAN-AU-TROL Spacers Eliminate Hole-Locating Jigs and Fixtures

Bullard 4"x 4" MAN-AU-TROL Spacer on 24" Cincinnati Bickford Super Service Box Column Upright...holes drilled, bored, reamed...accuracy of ± .0005" instead of former methods' ± .001"... production increased approximately 50%. Comparable results obtained with Bullard 30" x 20" Spacer.

Bullard MAN-AU-TROL Spacers now on production lines are more than living up to advance notices...eliminating jig costs, freeing men for more productive work, increasing volume and accuracy, reducing operators' fatigue. Write for the MAN-AU-TROL Spacer Bulletin. The Bullard Company, Bridgeport 2, Conn.

BULLARD

CREATES NEW METHODS TO MAKE MACHINES DO MORE

FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after June 15, 1947)

MACHINES AND ATTACHMENTS

1 JIG BORERS—Bryant Machinery & Engineering Co., Chicago 6, Ill. 32-page catalog 310 on jig borers manufactured by Cleerman Machine Tool Co., distributed by Bryant. Covers accessories, operation, and applications.

2 DISK GRINDERS—Hanchett Mfg. Co., Big Rapids, Mich. 12-page bulletin 546-1 describes and illustrates single-spindle disk grinders. Bulletin 46-1 on grinders for railway shops also available.

3 MILLING MACHINE—Van Norman Co., Springfield 7, Mass. Bulletin describes No. 2 heavy horizontal milling machine. Gives information on plain and universal models.

4 DRILLING AND TAPPING—Chas. G. Allen Co., Barre, Mass. Three bulletins describe drilling and tapping machines. Nos. 2, 2½ Type MSV, and 3 are V-belt vertical-motor drives. No. 2½ Type MSPF has a motor spindle.

5 RIVETING MACHINES — H. P. Townsend Mfg. Co., Hartford 1, Conn. New monthly bulletin, "The Townsend Riveter" gives case studies of riveting with information on applications of riveting machines.

6 PUNCH-PRESS FEEDS—H. E. Dickerman Mfg. Co., Springfield, Mass. Two 8-page bulletins describe Hitch and Die feeds for punch presses. Feeds are used with coiled materials, and two or more feeds can be used on same die.

7 IMPACT MACHINE — Chambersburg Engineering Co., Chambersburg, Pa. 14-page bulletin 2-L-6 describes and illustrates Cecostamp, an air-operated impact machine for forming metal shapes.

8 SHAPERS — Sales Service Machine Tool Co., St. Paul 4, Minn. 4-page bulletin describes 8-in. stroke Hy-Duty Shape-Rite shapers, which have either plain or swivel tables.

9 BORING MACHINES—Barrett Machine Tool Co., Meadville, Pa. 6-page bulletin B-2000 covers specialized horizontal boring machines. Lists dimensions, capacities and feeds.

10 PRESSES — Verson Allsteel Press Co., Chicago 19, Ill. 4-page bulletin describes Nos. 7 and 7½ open-back inclinable presses of 87- and 105-ton capacity, respectively.

11 CUTTER GRINDING—Covel Mfg. Co., Benton Harbor, Mich. 128-page revised book, "Universal Cutter and Tool Grinding," includes grinding machines and attachments, adaptability, grinding wheels, setup, 12 pages of tables, and shop-terms glossary.

TOOLS AND ACCESSORIES

12 DIE SETS—E. A. Baumbach Mfg. Co., Chicago, Ill. 264-page book, catalog 45, describes die sets and gives prices and dimensions. Includes accessories and style charts.

13 HACKSAW BLADES — John H. Graham & Co., Inc., New York 8, N. Y. 16-page bulletin describes G. W. Griffin Co. hacksaw blades and handsaw blades. Includes price lists and tables of blade lengths, pitches and speeds.

14 FILES—Grobet File Co. of America, Inc., New York 13, N. Y. 24-page booklet lists 3,566 Swiss files. Includes rotary files, deburring files and countersinks.

15 SOUND TESTER—National Broach and Machine Co., Detroit, Mich. 8-page bulletin describes Red Ring Gear Speeder, a machine which tests gear sets for errors by magnifying gear sounds.

16 TOOLHOLDERS — Airo Products Co., Los Angeles 43, Cal. 4-page bulletin illustrates Fry multiduty toolholders for large and small engine lathes.

17 STIFFNESS GAGE—Taber Instrument Corp., North Tonawanda, N. Y. 6-page bulletin describes and illustrates Taber U-5 stiffness gage for determining initial and normal stiffness in wire and sheet.

18 FLEXIBLE-SHAFT TOOLS—Midwest Dental Mfg. Co., Chicago 51, Ill. 36-page catalog D describes dental-engine specialties, which are applicable to precision grinding, deburring and other jobs.

19 GEAR CHECKER—Orlandi Gear & Machine Co., Detroit 27, Mich. 8-page bulletin describes models 100 and 101 visual gear checkers which check pitch dia., concentricity, tooth spacing and other dimensions.

20 CARBIDE DIES—Carboloy Co., Inc., Detroit, Mich. Booklet D-120 on carbide dies for deep drawing sheet metal. Numerous jobs illustrated and described.

21 PLUG GAGES — United Precision Products Co., Chicago 18, Ill. 42-page catalog describes line of cylindrical plug gages, gage handles and plug-gage sets. Includes price lists.

HEAT-TREATING AND WELDING

22 AMMONIA INSTALLATIONS — Armour Ammonia Works, Div. Armour and Co., Chicago 9, Ill. 20-page booklet gives information on problems met with ammonia-consuming equipment used in metal-treating.

23 BLAST COILS—D. J. Murray Mfg. Co., Wausau, Wis. Catalog describes Grid blast coils, with information on installation, performance and specifications. Also available is 12-page booklet on Grid unit heaters.

24 STEAM GENERATORS — York-Shipley, Inc., York, Pa. 8-page bulletin describes and illustrates Steam-Pak generators for process steam, heating or hot water, and York-Shipley industrial burners.

25 ARC WELDERS—Hobart Brothers Co., Troy, Ohio. Three folders cover multirange arc welder with dual and remote control, auxiliary power arc welder, and various accessories and electrodes.

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26 INFRA-RED EQUIPMENT — The Fostoria Pressed Steel Corp., Fostoria, Ohio. 12-page bulletin describes Evenray infra-red equipment which is used for baking, drying, preheating, dehydrating and degreasing.

27 ATMOSPHERE GENERATORS — Bellevue Industrial Furnace Co., Detroit 7, Mich. 12-page catalog describes endothermic and exothermic furnace atmosphere generators and their application to heat-treating.

28 FILTERS—Industrial Filter & Pump Mfg. Co., Chicago 12, Ill. 8-page bulletin describes filters for alkaline and acidic electroplating solutions.

PLANT SERVICE EQUIPMENT

29 MAGNETIC SEPARATORS—The Homer Mfg. Co., Inc., Lima, Ohio. 4-page bulletin describes line of permanent magnetic separators used to eliminate iron and steel particles and pieces in manufacturing or processing operations.

30 INDUSTRIAL TRUCK — Mobilift Div., Vaughan Motor Co., Portland 14, Ore. 16-page bulletin describes and illustrates Mobilift, 2000-lb. capacity fork-lift truck. Standard masts lift to 68 or 108 in.

31 PORTABLE CRANES — The Hill Acme Co., Cleveland 2, Ohio. 4-page bulletin on "Canton" hand-operated portable cranes in 8 sizes from 2000 to 6000 lb. capacity. Two speeds of cable operation are available.

32 PALLET EXCHANGE — Lawrence Pallet Exchange Div., Lawrence Universal Pallet Corp., San Francisco 11, Cal. 16-page bulletin on pallet exchange includes loading and unloading data and costs, and control-station information.

33 PROTECTIVE PACKAGING — Coatings Div., R. M. Hollingshead Corp., Camden, N. J. 12-page bulletin 5559 describes Cocoon protective packaging, generally applied by spraying. Used for materials from weapons to machine tools.

34 CASTERS — The Rapids-Standard Co., Inc., Grand Rapids 2, Mich. 42-page catalog 65-3 covers line of casters with information on mounting and how to select correct caster for particular application.

35 ELECTRIC TRUCK — Automatic Transportation Co., Div. The Yale & Towne Mfg. Co., Chicago 20, Ill. 6-page bulletin describes Skylift hydraulic electric truck with 130-in. lift from floor to forks.

36 INDUSTRIAL TRUCKS — Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich. 84-page pocket catalog on industrial haulage vehicles includes fork trucks, towing tractors, and dump and shovel trucks. Also available is 2-page bulletin on expendable pallets.

PARTS AND MATERIALS

37 VARIABLE-SPEED CONTROL — Reeves Pulley Co., Columbus, Ind. 96-page catalog G-450 on variable-speed transmission, Vari-Speed motor pulley and Vari-Speed Motodrive. Includes descriptions and engineering data.

38 AUTOMATIC CONTROLS — General Controls Co., Glendale, Cal. 52-page catalog 52C describes BC automatic controls for pressure, temperature and flow control of oil, air, water, steam and other fluids.

39 SYNTHETIC RUBBER — Acadia Synthetic Products, Div. Western Felt Works, Chicago, Ill. Booklet describes raw materials, manufacture, and finished synthetic-rubber products. Includes 24 pages of tabular studies of numerous compounds.

40 PNEUMATIC EQUIPMENT — National Pneumatic Co., Rahway, N. J. Folder contains twelve bulletins and price list covering pneumatic arrangements including operating equipment for kickpresses, drillpresses and spinning machines.

41 WIRE AND CABLE — Apparatus Dept., General Electric Co., Schenectady, N. Y. 16-page bulletin GEA-4352 on Flamenol style FL insulated wire and cable describes manufacture, applications and types.

42 DIESEL LUBRICATION — Industrial Products Dept., Sun Oil Co., Philadelphia 3, Pa. 48-page bulletin B-1 on diesel-engine lubrication includes information on diesel engines, fuels, lubrication and lubrication systems.

43 BEARINGS AND BUSHINGS — Johnson Bronze Co., New Castle, Pa. 80-page catalog 460 describes general-purpose bearings and bushings, and graphited, self-oiling and electric-motor bearings. Also covers bronze bars and oil grooving.

44 POWDER METALLURGY — Keystone Carbon Co., Inc., Saint Marys, Pa. 46-page revised catalog on powdered-metal parts and powdered-metal self-lubricating bearings. Includes section on correct design of parts.

45 ROTARY PUMPS—Viking Pump Co., Cedar Falls, Iowa. 8-page bulletin 46-S covers construction, operation, installation and applications of rotary pumps. If pumps are operated in opposite direction, flow is reversed.

46 STEEL SHEETS—Continental Steel Corp., Kokomo, Ind. 20-page catalog describes and illustrates steel sheets and wire. Contains information on sizes and properties.

47 ALUMINUM CASTINGS — General Aluminum Mfg. Co., Cleveland 4, Ohio. 12-page bulletin on aluminum permanent-mold and sand castings. Tables give specifications, composition and properties.

48 AIR CYLINDERS — Hanna Engineering Works, Chicago 22, Ill. 26-page catalog 234 describes and illustrates air cylinders, giving dimensions and types. Includes hand- and foot-operated valves and speed-control valves.

49 HEAT RESISTANCE — Cerium Metals Corp., 522 5th Ave., New York 18, N. Y. 14-page booklet, "The Influence of Minor Elements on the Heat Resistance of Standard Alloys," translated from German from work by W. Hessenbruch.

50 VOLTAGE REGULATORS—Sorensen & Co., Inc., Stamford, Conn. 16-page catalog describes electronically controlled voltage regulators and Nogatrons. Covers entire line of electronic apparatus.

51 RUST-PREVENTATIVE SAMPLE —Frost Paint and Oil Corp., Minneapolis 13, Minn. Sample of No-Rust, a rust preventative which is sprayed or brushed on surface, presents a hard surface and can be removed by wiping with kerosene or distillate.

52 STAINLESS STEEL—Joslyn Stainless Steels, Fort Wayne 6, Ind. Stock list of stainless steels, published monthly, listing rounds, flats, squares, hexagons, wires, angles and channels.

53 STEEL—Lukens Steel Co., Coatesville, Pa. 132-page revised manual "Flanging and Pressing" includes flanged and dished heads with price lists for forming and machining. Tables include theoretical weights of plate, sizes of sheet and plate and logarithms.

MISCELLANEOUS

54 INJECTION MOLDING—Tennessee Eastman Corp., Kingsport, Tenn. 36-page manual on injection molding is for use of injection molders and prospective manufactures of molded products from Tenite I and Tenite II.

55 DECAL SELECTOR — The Meyercord Co., Chicago 44, Ill. Decal nameplate selector is a guide to selection of decals for unusual surfaces.

AMERICAN MACHINIST
330 West 42nd Street
New York 18, N.Y.

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A penny saved is Big Money

Unretouched photo of Tube Turns forging right off the press

When it comes to forgings of this type in mass-production quantities, a penny or fraction of a penny saved per piece can amount to a young fortune in total money saved.

Such savings are made possible by TUBE TURNS smoothly coordinated forgings production system. Every operation involved has been organized to keep pace with the speed of TUBE TURNS high-speed mechanical presses and upsetters.

TUBE TURNS' progressive die designing, die making abilities and modern equipment give you forgings that come close to machined tolerances, as forged. And there you have another saving—in pounds of metal required, in manpower needed to finish the job, in wear and tear on your machine tools.

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY

District Offices at New York, Washington, D. C., Philadelphia, Pittsburgh, Detroit, Chicago, Houston, San Francisco, Los Angeles.

TUBE TURNS tt Forgings for Industry

Your first touch tells you why...

P-K GROUND THREAD SOCKET SET SCREWS ARE YEARS AHEAD BY EVERY TEST

• You don't need to be a skilled mechanic to detect the difference between ordinary cut thread socket set screws and *Ground Thread* Socket Set Screws pioneered by Parker-Kalon. Not only can you see it . . . but you can actually feel it!

Your first touch will tell you that its smoother surface is free from nicks, burrs, hardening cracks and other imperfections common to cut threads. And because the threads are ground on hardened blanks, hardening distortion is no longer a factor, and you can count on uniform, dependable Class 3 fit.

Talk to any good mechanic about these advantages in terms of assembly operations. He'll tell you that they assure easier starting and faster assembling. What's more, using and featuring P-K Ground Thread Socket Set Screws on any product is a good way to lift it a cut above competition.

PROMPT DELIVERIES OF SOCKET SCREWS
You can start *now* to benefit by the extra advantages of both P-K Ground Thread Socket Set Screws and Socket Head Cap Screws. With P-K's improved production facilities ample stocks of Socket Screws are available now.

PARKER-KALON *Cold-forged* SOCKET SCREWS

SEE AND FEEL THE DIFFERENCE!

Get this unique, free sample kit that illustrates these improvements better than words. Compare! You'll agree your products will benefit—assembly-wise and sales-wise! *Write—Parker-Kalon Corp., 200 Varick Street, New York 14.*

ANOTHER P-K FIRST

*☆ Size-Marked-Gear Grip**

SOCKET HEAD CAP SCREWS

Quick, Sure Size Identification. The Size-Mark, clearly incised on the head, gives you size and thread pitch at a glance. Eliminates guessing or "miking". Saves time and errors at tool crib or on assembly line.

Better Control. Gear-Grip* prevents slips and fumbles even when fingers are oily. Gives highly paid hands a head start.

*U. S. Pat. No. 126,409

★ SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS ★

How Many Spare V-Belts Do You Really Need?

With only four reels of Veelos, he has a choice of 316 standard sizes.

WHEN Veelos on reels goes into a stockroom, a costly mass of many-size endless V-belts is eliminated. Four reels of Veelos, the link V-belt, provide replacements for as many as 316 sizes.

Do you require less? From a single 100-foot reel of Veelos any length V-belt can be quickly uncoupled, made endless and installed. You need *not stock even one* spare endless V-belt. There is none to age and deteriorate. With Veelos on reels, desired belt lengths are always available, easy to locate. Stock records are simplified... storage space saved.

Veelos is available in all standard sizes, fits all standard grooves, is packaged on standard 100-foot reels. Ask about the many, exclusive advantages of Veelos on reels.

Over 300 Veelos distributors and sales engineers located in principal cities to serve you.

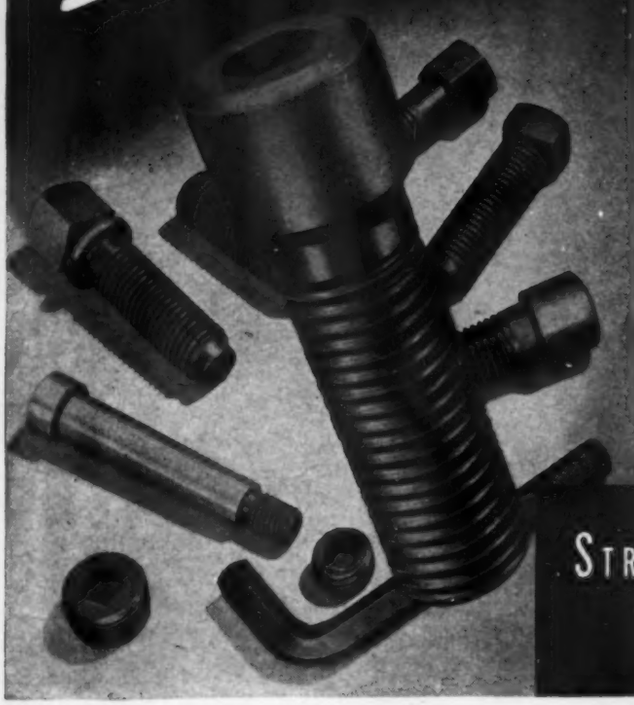
MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

VEELOS
THE LINK
V-BELT
Adjustable to any Length
Adaptable to any Drive

Tested, Proved and Adopted by American Industry

Known as VEELINK outside the United States

Mac-it ALLOY STEEL SCREWS



Greater strength, more compact design with SOCKET HEAD CAP SCREWS!

Mac-it Socket Head Cap Screws will give you added holding power and permit more compact design where necessary. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

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It Pays to Specify TUTHILL Model C for General Purpose Pumps

Low in first cost, and engineered for long service with negligible maintenance, Tuthill Model C pumps are outstanding in general service on non-corrosive liquids. Compact and built for rugged service, these internal-gear rotary pumps operate efficiently in either rotation. Capacities from 1 to 200 g.p.m. at pressures up to 100 p.s.i. Direct drive, belt drive, V-belt units and stripped models available. Write for Model C bulletin.

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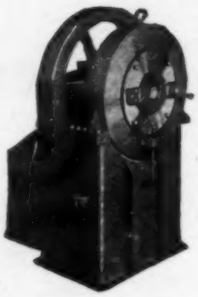
939 East 95th Street • Chicago 19, Illinois



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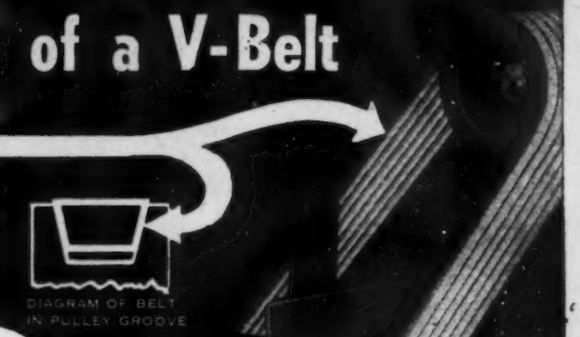
You Can SEE That

It's ONLY the SIDE of a V-Belt

That Grips the Pulley and *Gets the Wear!*



Look at a V-Belt in its sheave and you see at once that the *sides* of the belt do all the gripping on the pulley and get all the wear against the sheave-groove wall.

Notice, too—it's the *sides* that pick up all the power delivered by the driver pulley. The sides *transmit* that power to the *belt as a whole*. And then, once more, it's the sides—and the sides *alone*—that grip the driven pulley and *deliver* the power to it.

That is why you have always noticed that the sidewall of the ordinary V-Belt is the part that wears out first.

—*and Here Is How the* CONCAVE SIDE ★REDUCES Sidewall WEAR *and Lengthens Belt Life!*

Clearly, since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will lengthen the life of the belt.

The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the *middle* of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

★More Important NOW That STRONGER Tension Members are Used

Now that Gates *Specialized* Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall the life-prolonging Concave Side is more important today than ever before!

THE GATES RUBBER COMPANY Denver, U. S. A.

"World's Largest Maker of V-Belts"

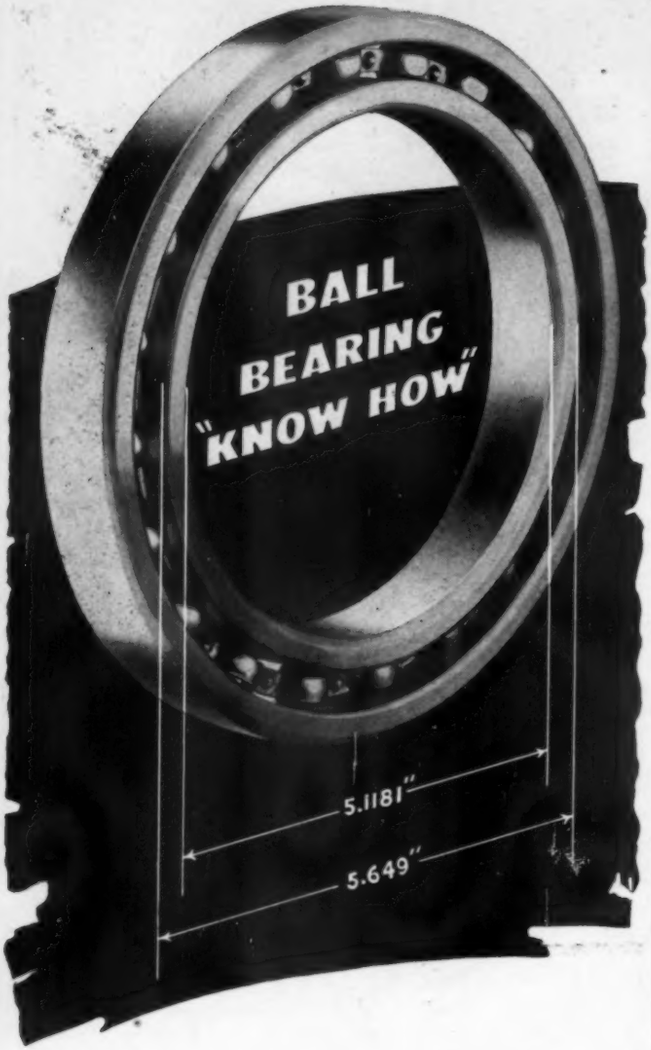
473

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

Gates

THE MARK OF SPECIALIZED RESEARCH



NOTE the exceptionally large diameter in relation to the race thickness of this radial ball bearing. It is not just an ordinary ball bearing —it's one that takes "ball bearing know how" to turn out to the exacting specifications of our customer. Tolerances allowed are close, for the piece of machinery into which this bearing goes is quality from end to end.

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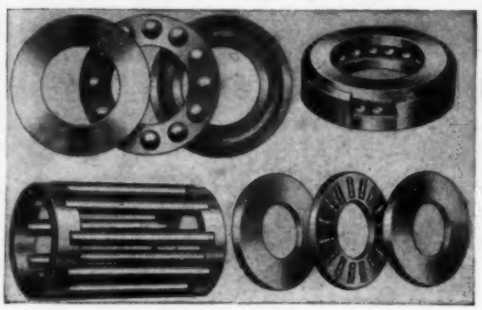

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. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

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There's strength in numbers . . .

it's the combination of many fine strands in a wire rope that gives it great tensile strength.

It's the use of a maximum number of small diameter precision rollers in the Torrington Type NCS *Needle* Bearing that enables it

To carry heavy loads . . .

for the load stresses are distributed over the largest possible area of bearing surface. Heavy outer and inner races back up the carrying capacity of the full complement of rollers, contributing to their record performance under enormous radial loads in many different types of equipment.

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Check these advantages with your *flush fastening* requirements, *and call your local Allen* Distributor:

(1) Flush top surface with no gap between screw head and surrounding metal. (2) Extreme rigidity of grip, because angle of head helps lock screw in place by drawing down on a conical surface. (3) Firmer hold on thin plates of metal, by more binding surface under the head than in fillister type or cheese-head screws. (4) Shallower countersink — less weakening of metal — when used for fastening a relatively thin plate. (5) Positive engagement of hex key transmits power for tightest of set-ups without slipping, reaming or side play. (6) Maximum strength of screw itself assured by *"pressur-forming"* of special-analysis ALLENOY steel. Threaded to a high Class 3 fit. (7) Speed in assembly provided for by use of Allen hand drivers.

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range of applications
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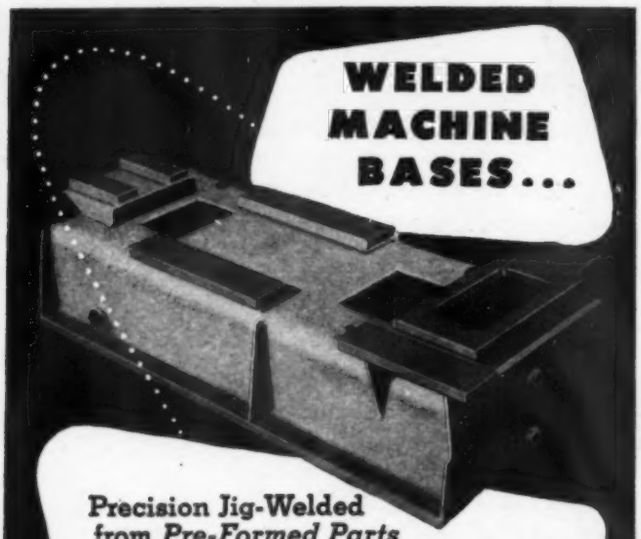

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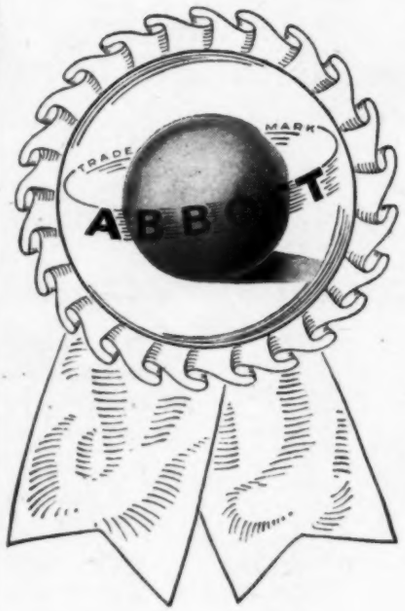

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Thor Air Hose Couplings form positively locked connections that cannot break, jar or whip apart. Tool operators prefer their simplicity . . . and the speed and ease with which they can be connected and disconnected. All sizes and combinations are interchangeable up to ¾ inches, inclusive. Each hose end is identical with the other—no right or left . . . no male or female—*a real universal coupling that fits every job.* Made of heavy, rust-resisting steel for lasting service. Call your Thor distributor for a demonstration.

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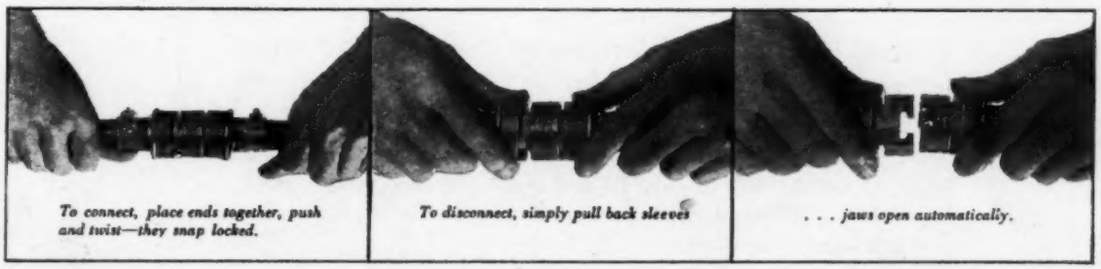

To connect, place ends together, push and twist—they snap locked.

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. . . jaws open automatically.

Thor PORTABLE POWER TOOLS

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A LOW CARBON OPEN-HEARTH PRODUCT

is still scarce because we are waiting on others just as you are waiting on us. We have increased our production but the demand for this steel has surpassed our fondest hopes. Why such a demand? Because SPEED CASE cuts like AISI B1113 at 250 SFPM and has a tensile strength of 80,000-90,000 PSI. It machines 40% to 50% faster than ALL OTHER CASE CARBURIZING STEELS, increases tool life 2 to 5 times and "steps up" production 30% to 100%.

WHILE WAITING . . . ***Do This at Our Expense. Write for samples . . . Be ready for SPEED CASE when it's ready for you.***

When you notify us that your samples have arrived we will send our PRODUCTION EXPERT to you. He will show you, in your own plant, how SPEED CASE will improve or maintain the quality of your product and increase your production 30% to 100%.

ACTUAL PHOTOGRAPH

Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.

Tear off here **ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW**

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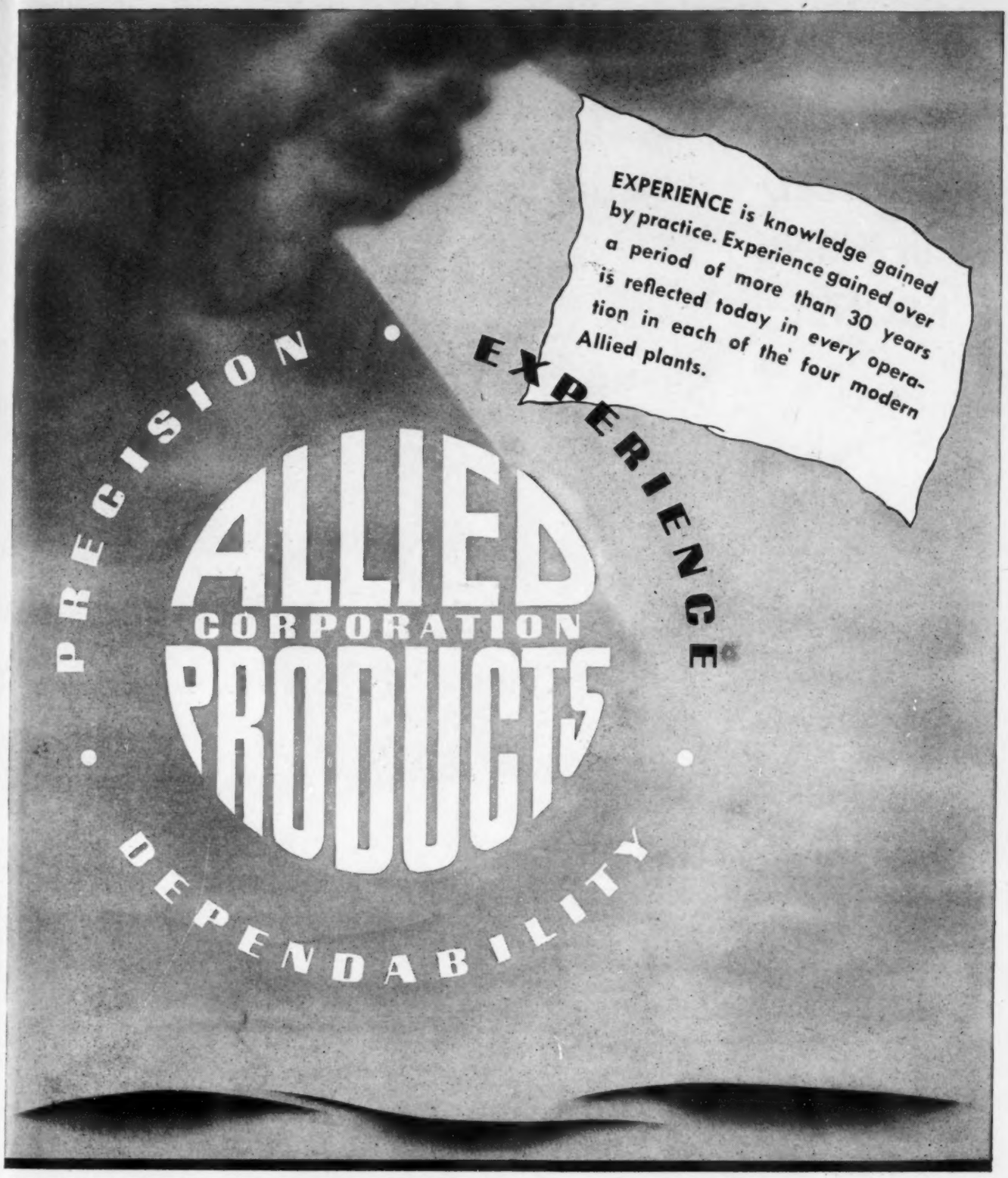
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* If you have a special machine-tool oil and coolant cleaning problem for which these equipment combinations do not seem satisfactory, please allow us to send a sales-engineer to make a survey and recommendations at no obligation. For full information and specifications on all Honan-Crane clarification equipment—and case histories of installations, please clip off and mail this panel with your name, title and address.

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1947

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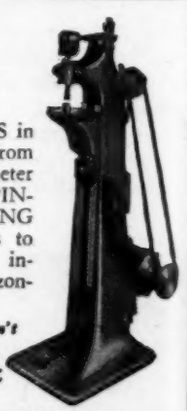

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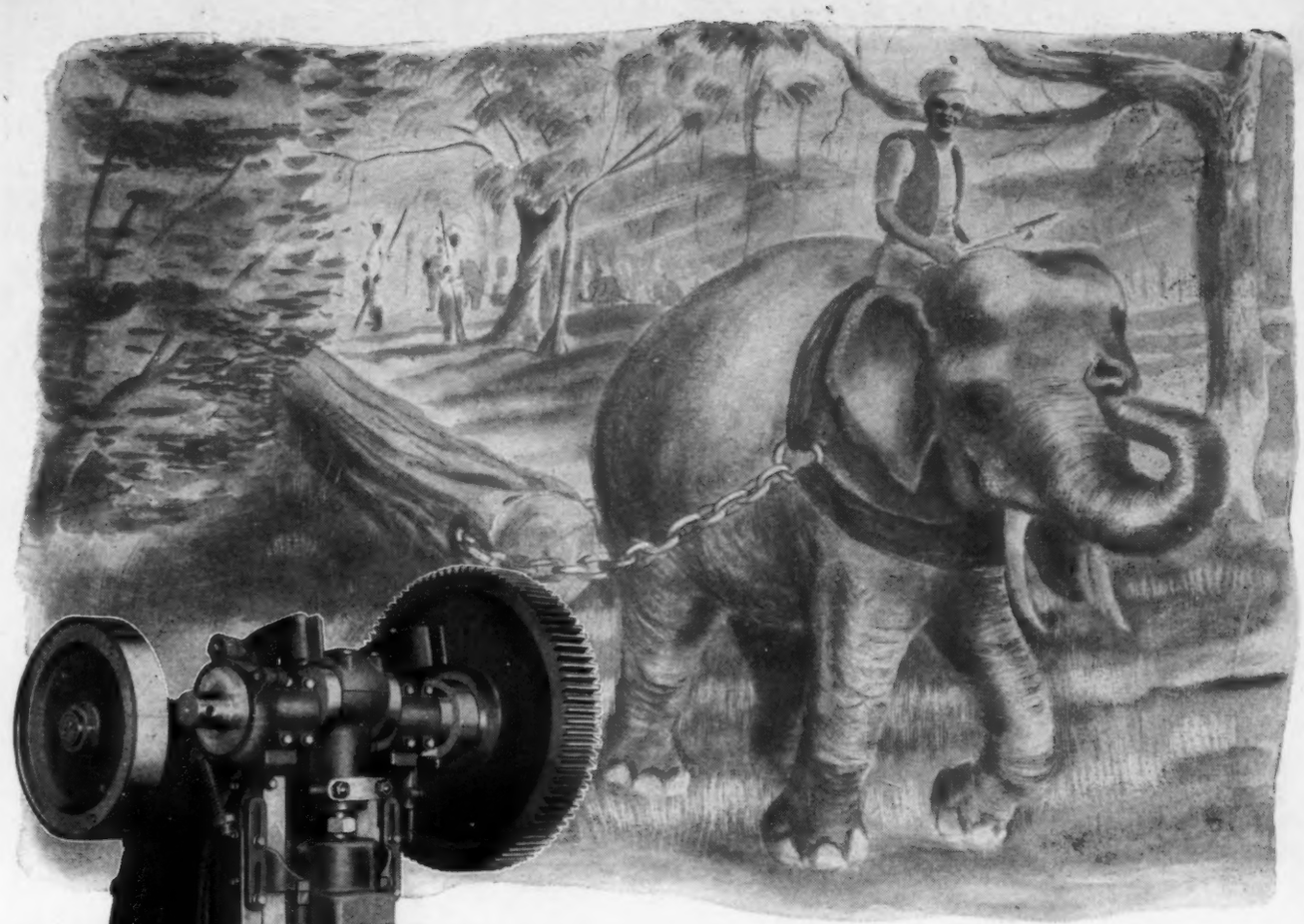

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BAUMBACH *The DIE SET AUTHORITY*

All Baumbach Die-Sets have demountable Loader Pins and Bushings. This exclusive feature permits removing Loader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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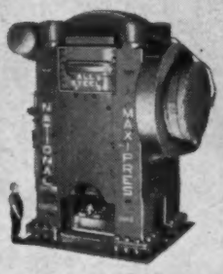
This 10″ diameter aluminum supercharger impeller for stratosphere aircraft engines is an "impossible forging" on conventional forging equipment.

On the National Maxipres, however, it is forged with ease. The detail is sharply defined, the physical qualities and finish are excellent and production is unequalled.

It will pay you to investigate the possibilities of the Maxipres.



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The former spells PRODUCTION . . . PROFIT; the latter spells NON-PRODUCTION . . . LOSS.

Based on a recent impartial survey, screw machine experts voted H & G Insert Chaser Die Heads their *number one choice.*

A DAYTON man gives this reason: *"Holds size better. Threads straight and true."* A NEW HAVEN man says: *"Accuracy, performance, economy."* A man in HARTFORD writes, *"More threads per grind."* From CINCINNATI comes this: *"For close to shoulder threading."* From SAN DIEGO a leading screw machine parts producer writes: *"Interchangeability of chasers for different styles of die heads."* A manufacturer in WORCESTER says: *"Low price chasers . . . Quick to set. Uniform high quality threads."*

Simple Strong Accurate

Sizes and Styles for all machines on which threads are cut

H&G Insert Chaser DIE HEADS

LITERATURE ON REQUEST

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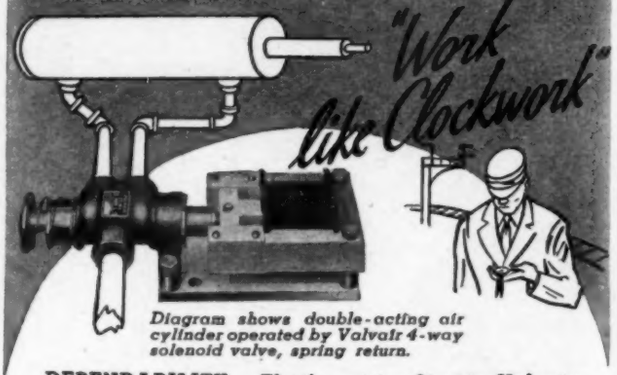

Diagram shows double-acting air cylinder operated by Valvair 4-way solenoid valve, spring return.

DEPENDABILITY — That's outstanding in Valvair performance. Solenoids are Stellite-welded to resist wear; do not mushroom. Standard Valvairs have operated over 2,000,000 times at 100 lbs. with never a leak. *Exclusive features.* Patented basic design eliminates metal seats; non-corrosive (cast bronze body, stainless steel parts); full pipe area used with minimum drop. 2-way, 3-way, 4-way types. Get full details and prices.

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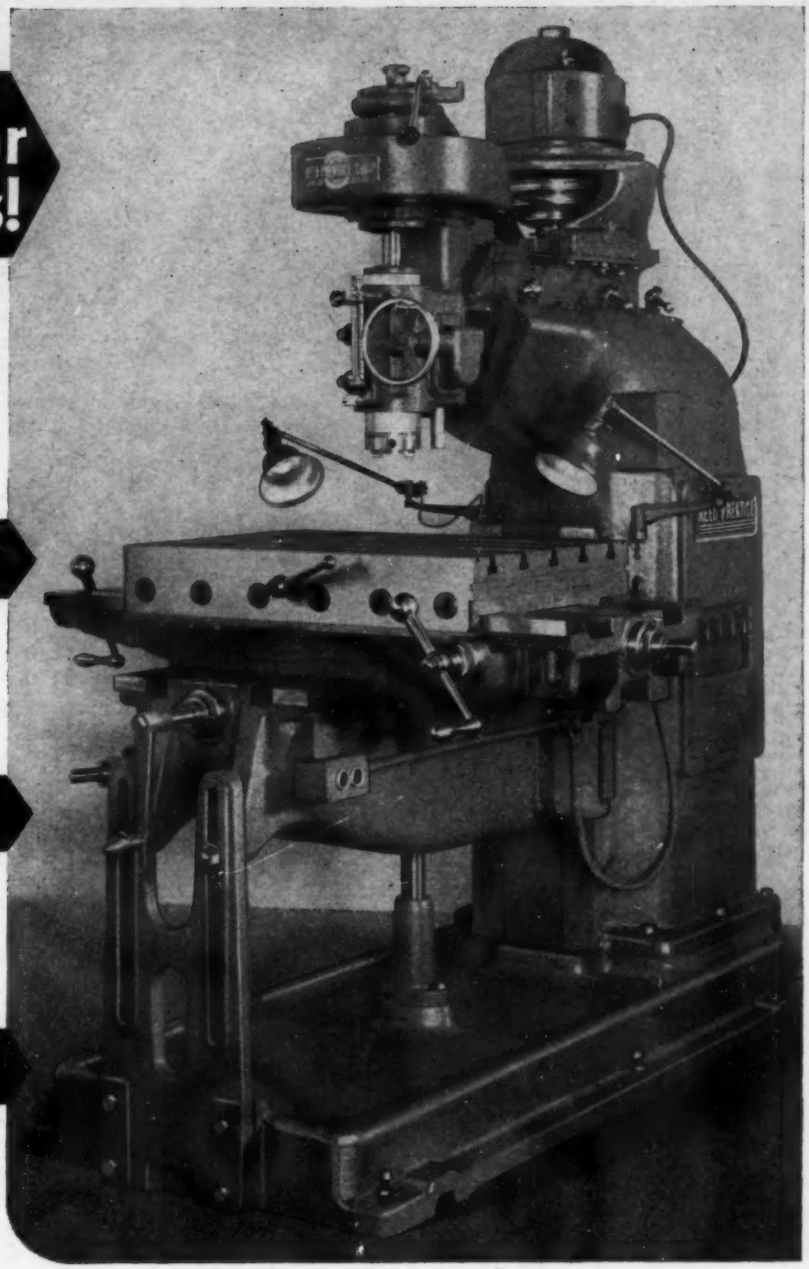
Valvair

New 22-V for Die & Mold Makers!



This new heavy duty Reed-Prentice 22-V milling machine is equally suited for high speed routing and die sinking. It is designed to economically make plastic and rubber molds, die casting and forge dies. In fact, its versatile range will accomodate such work as the making of tire molds.

WIDE RANGE

Large table 32" x 22" x 4", throat depth of 30". Head mounted on horizontal ram with 16" adjustment provides wider range forward and backward.

RUGGED

Extreme rigidity of head and spindle construction permits use of large diameter or two lip cutters. Spindle supported at top by precision ball bearings, at bottom by tapered roller bearings.

SMOOTH

Vee belt assures chatterless operation for die sinking work at high or low speeds. Roller bearings on table and saddle permit exceptionally easy movement. Table and saddle ways are hardened and ground.

SPECIFICATIONS

1. Longitudinal feed — 27"
2. Cross feed — 20"
3. Vertical feed of Knee — 16"
4. Ram adjustment (horizontal) — 16"
5. Table — length by width by thickness — 32" x 22" x 4"
6. Spindle speeds — 133 to 2600
7. Vertical travel of spindle — 5"
8. Throat depth (maximum) — 30"
9. Maximum distance, spindle to table — 20"

MAIL COUPON NOW

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Please send full information and literature on the Reed-Prentice 22-V Miller and Die Sinker to:

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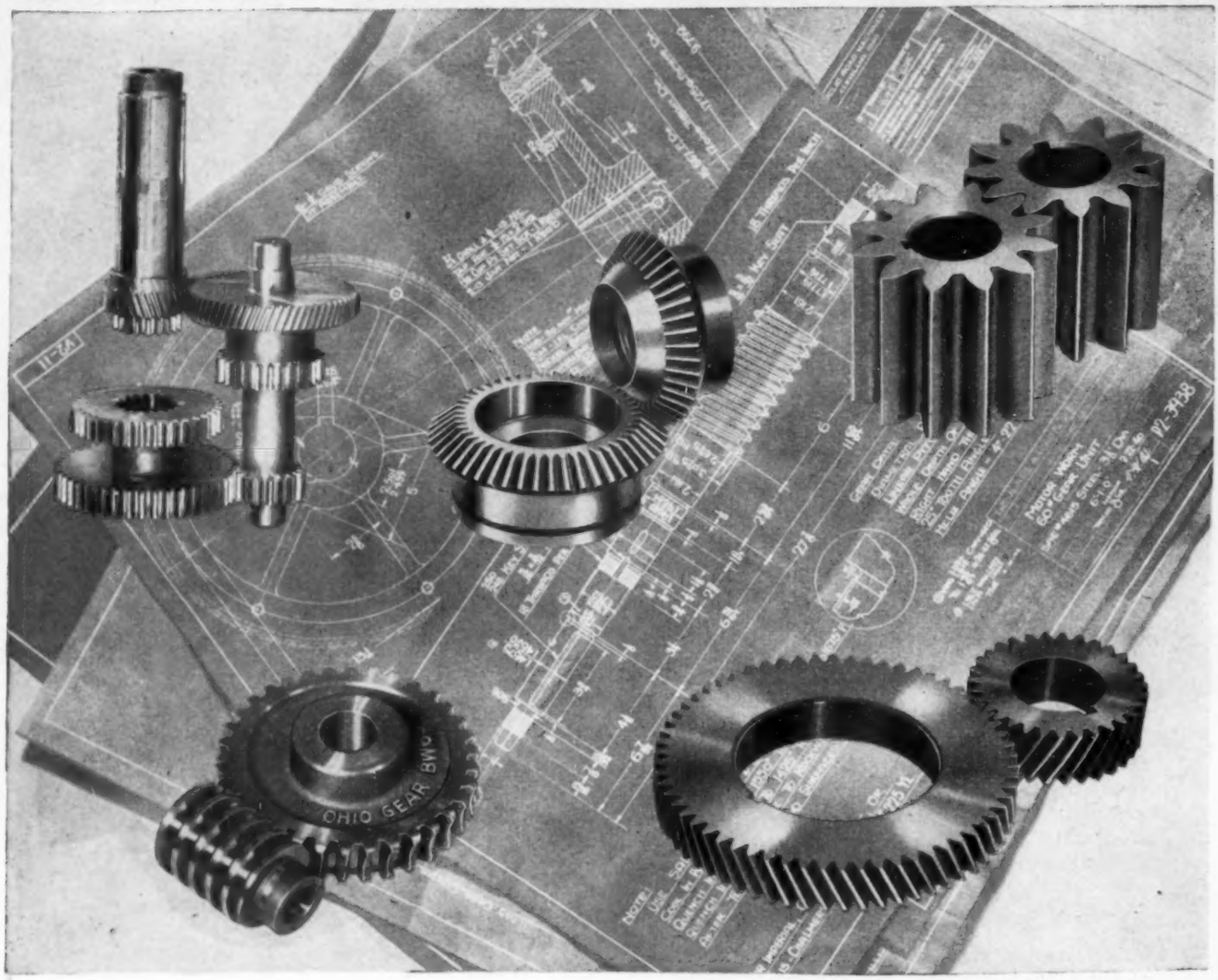

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PHILLIE GEAR

—any SIZE or TYPE
...for any service

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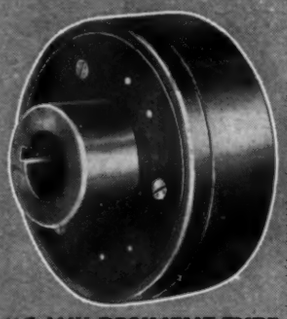
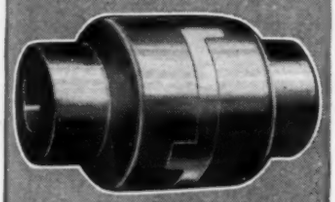
Popularly used sizes of most couplings are carried in stock and deliveries can be made quite promptly.

Shown here are the different types of *Flexible Couplings* which we can highly recommend to best meet the required needs.



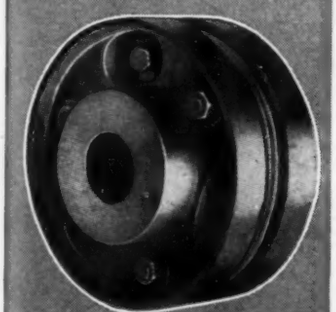
"C-W" RESILIENT TYPE

The most resilient coupling and best suited for extreme torsional vibration applications, but not recommended where there is frequent reversal of torque.



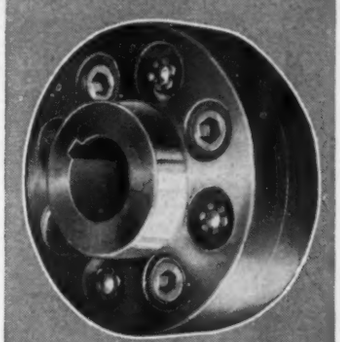
OLDHAM TYPE

Is recommended for speeds of 50 R.P.M. and below, and particularly adapted for installations where parallel misalignment errors are relatively large, and where angular misalignment errors are inappreciable.



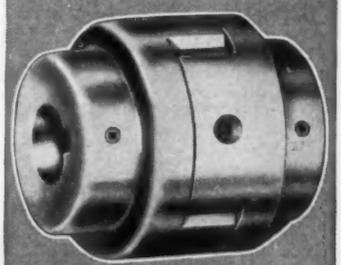
THERMOID TYPE

Designed and built to meet the demand of a more flexible and vibrationless coupling.



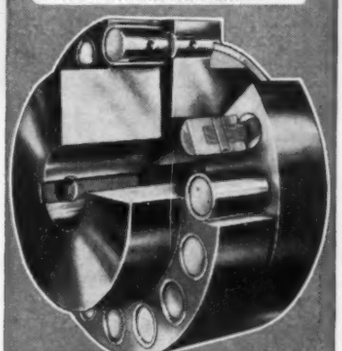
AJAX TYPE

Specially constructed to absorb and dampen shock, vibration, starting torque and momentary overload — by means of live rubber bushings.



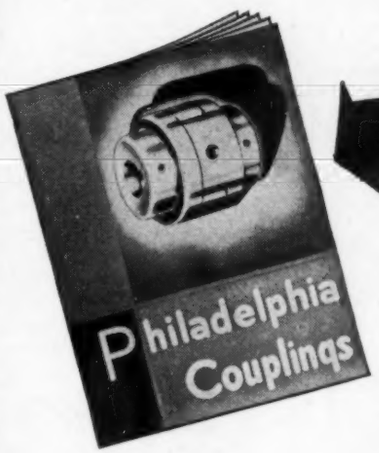
PHILA. FLEXIBLE TYPE

Widely used for "general purpose" work. . . . Flexibility is obtained (without the use of flexible materials) by means of a floating center block of non-metallic material.



FRANCKE TYPE

Well suited where torsional resilience is required with all-metal construction.



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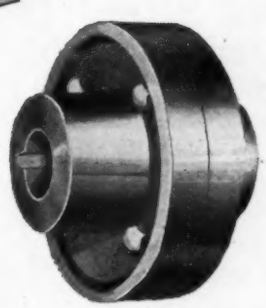

STEEL FLANGED TYPE →

A rigid coupling, and should not be used where both shafts are rigidly supported in bearings. Recommended for vertical drives such as agitators, where there is no lower bearing, or only one guide bearing.

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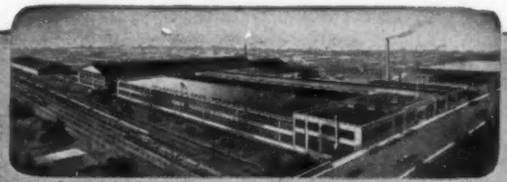

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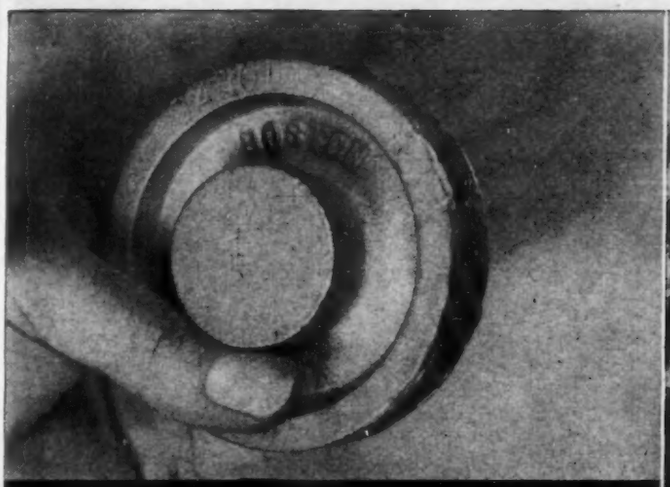
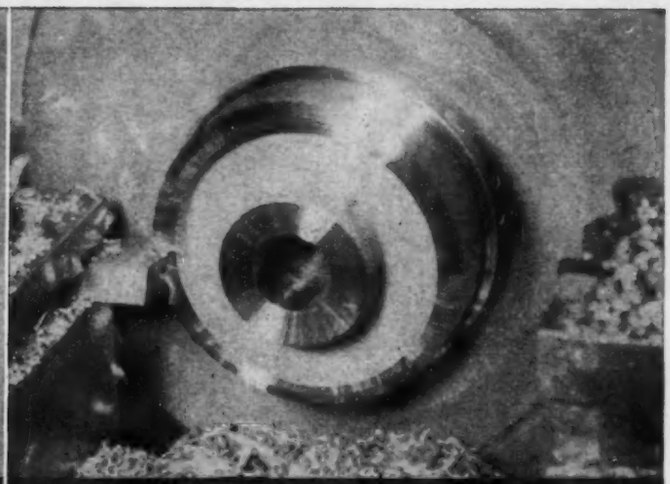


THE ROUGH WORM GEAR CASTING



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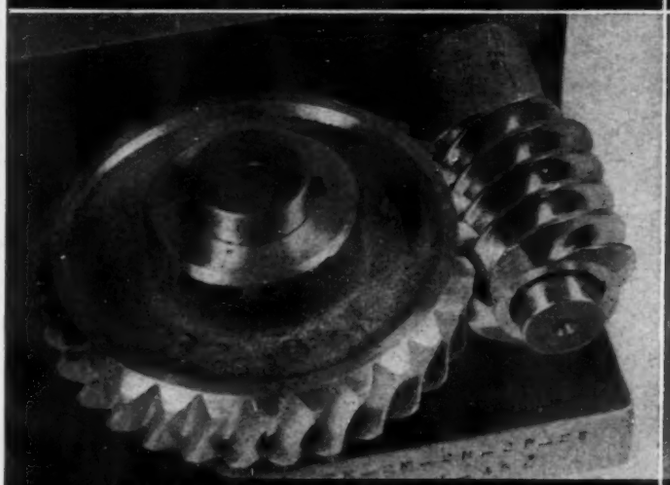
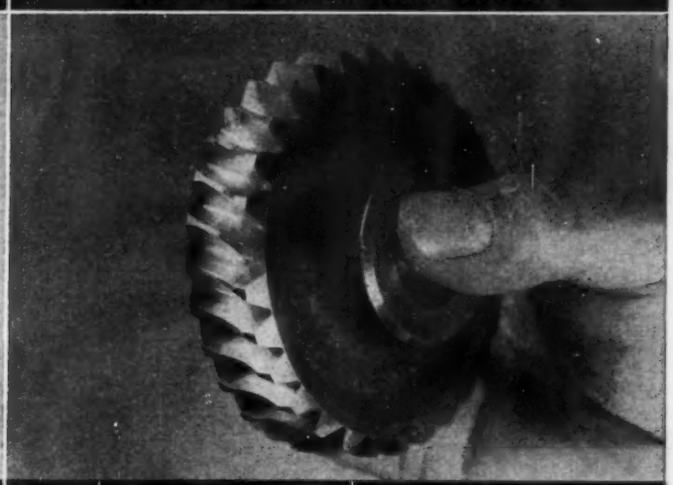


INSPECTION WITH MASTER WORM



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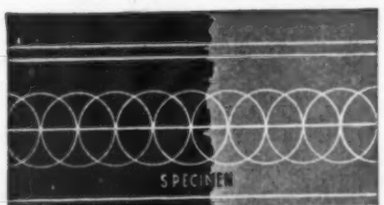

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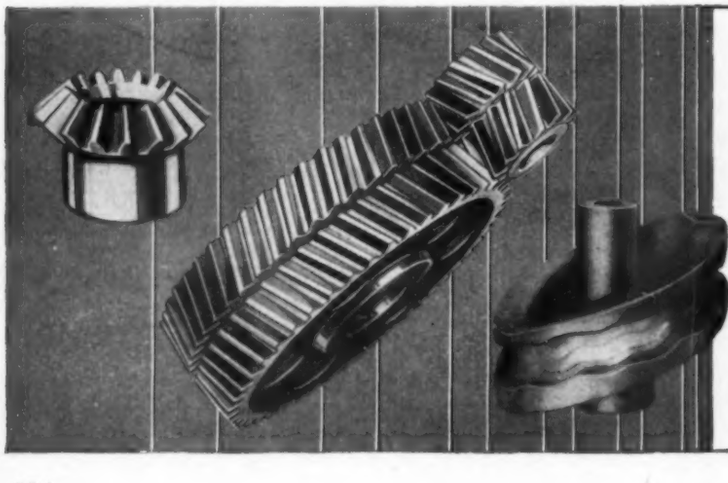

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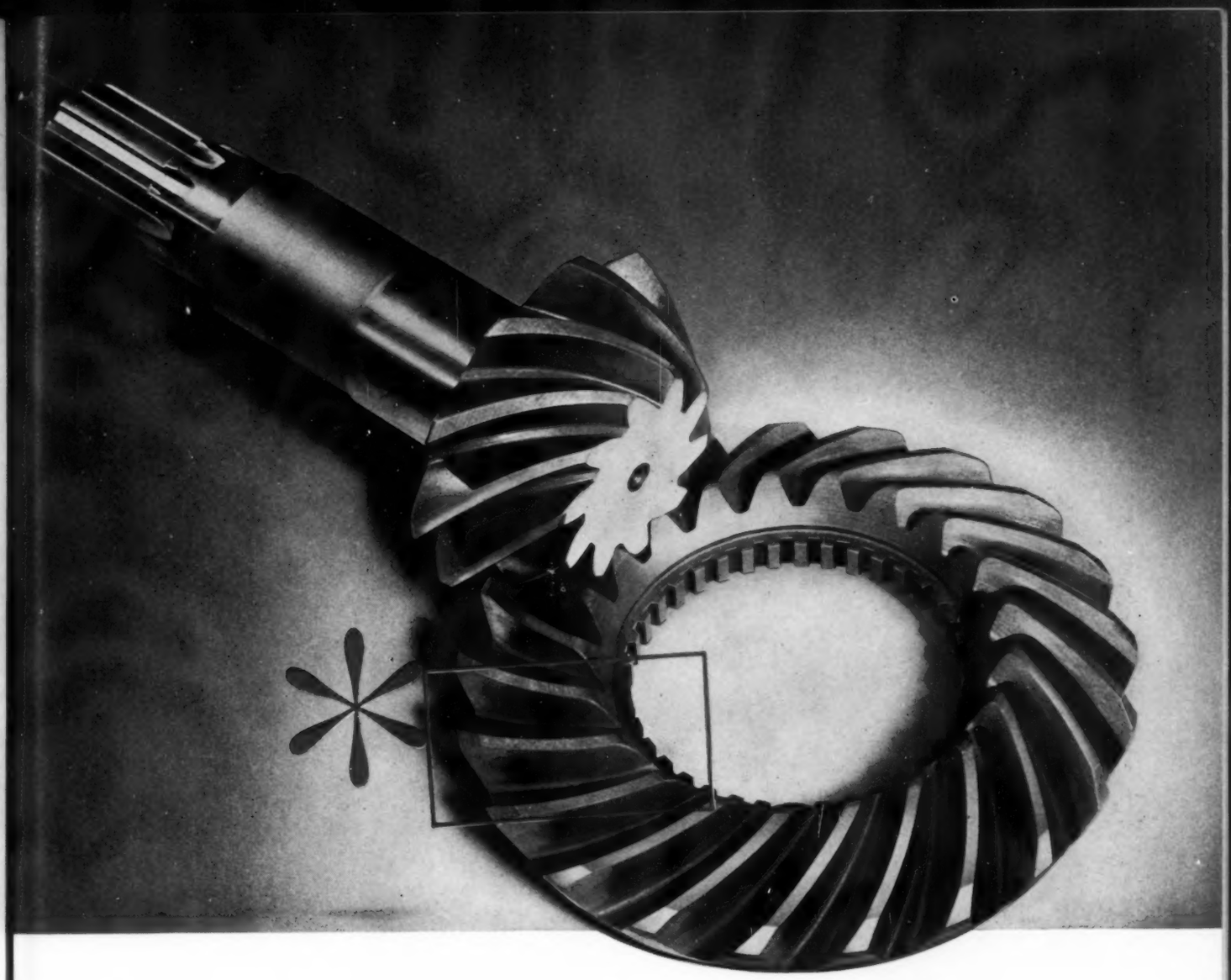
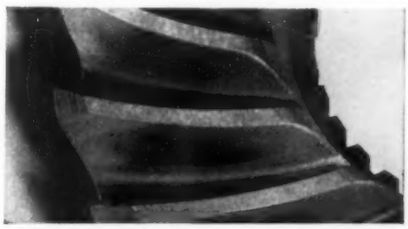


These marks are proof of physical fitness

THESE spiral bevel gears have a long, hard-working, quiet life ahead of them, as you can see clearly by the unretouched "test-marks" in the photograph at the right. These marks are made by coating the teeth with a pigment, then running the gears in proper position to remove the coating where tooth contact occurs. Observe the *uniformity* and the *localization* of tooth contact at the central portion of each tooth: proper for this application—proof of physical fitness for the job.

There's no magic to making gears as sound and as silent as these. We establish one *and only one* set of standards—then stick to it. Our men know our standard and hold to it—day after day—at every stage of operation from blanks to final lapping. That's the *only* way we know how to do business. If this fits in with your ideas, give us a call. Our engineers can start from a sketch, print, or at any stage of the development. Any time you say.



* *Uniform contact, localized at the strongest portion of each tooth is proof of maximum wear.*

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GEARS

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FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

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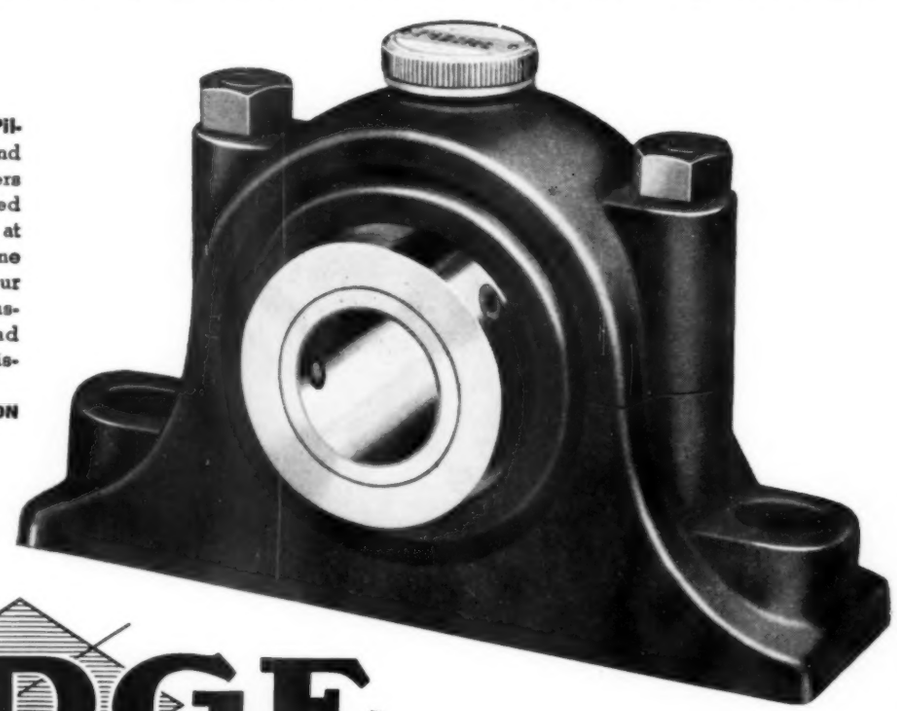

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STANDARD ENGINEERS NOTEBOOK

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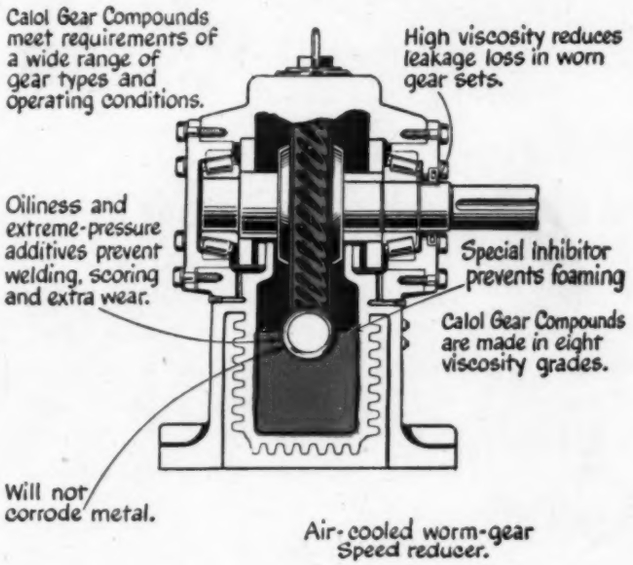
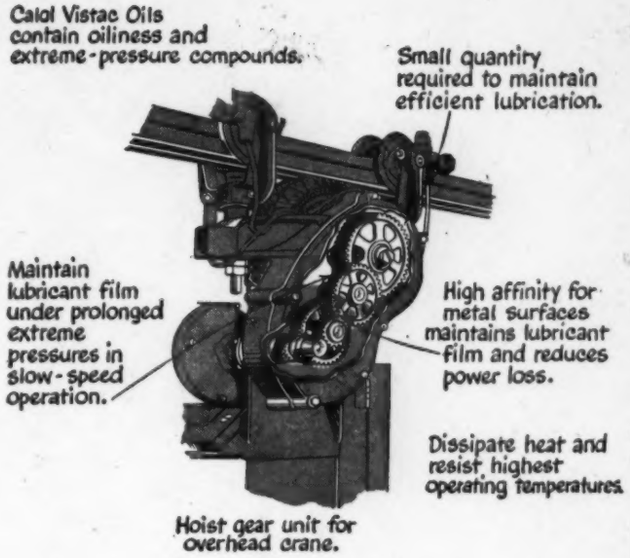
Calol Gear Compounds contain oiliness and extreme-pressure additives which prevent welding, scoring and excessive wear of gears operating in hard service, and contain a special inhibitor which eliminates foaming.

They are non-corrosive, retain good body in all working temperatures and minimize leakage from worn gear sets. In worn gears, they also reduce vibration and noise by keeping a cushion-like film in large clearances between the teeth.

Calol Gear Compounds are adaptable to and provide economical lubrication in many types of gear sets and in a wide range of operating conditions.


Calol Gear Compounds meet requirements of a wide range of gear types and operating conditions.
High viscosity reduces leakage loss in worn gear sets.
Oiliness and extreme-pressure additives prevent welding, scoring and extra wear.
Special inhibitor prevents foaming
Calol Gear Compounds are made in eight viscosity grades.
Will not corrode metal.

Air-cooled worm-gear Speed reducer.


Calol Vistac Oils contain oiliness and extreme-pressure compounds.
Small quantity required to maintain efficient lubrication.
Maintain lubricant film under prolonged extreme pressures in slow-speed operation.
High affinity for metal surfaces maintains lubricant film and reduces power loss.
Dissipate heat and resist highest operating temperatures.
Hoist gear unit for overhead crane.

Viscous and tacky oils keep tough film on gears

Heavy duty gears, such as industrial reduction sets, with forced-feed or gravity lubricators, sight-feed cups, bottle- or wick-oilers are safely lubricated with Calol Vistac Oils.

As the name "Vistac" implies, these oils are both viscous and tacky and have a high affinity for metal surfaces. They contain oiliness and extreme-pressure additives and provide a lubricant film of unusual strength. This film resists rupture even on slow-moving gears that develop extreme pressures over a wide area for a relatively long time.

In addition to being outstanding gear lubricants, Calol Vistac Oils are excellent for air hammers, rock drills and other air tools. They rapidly carry away heat, resist high temperatures, stay fluid at low temperatures and atomize quickly. There are six viscosity grades of Calol Vistac Oils:

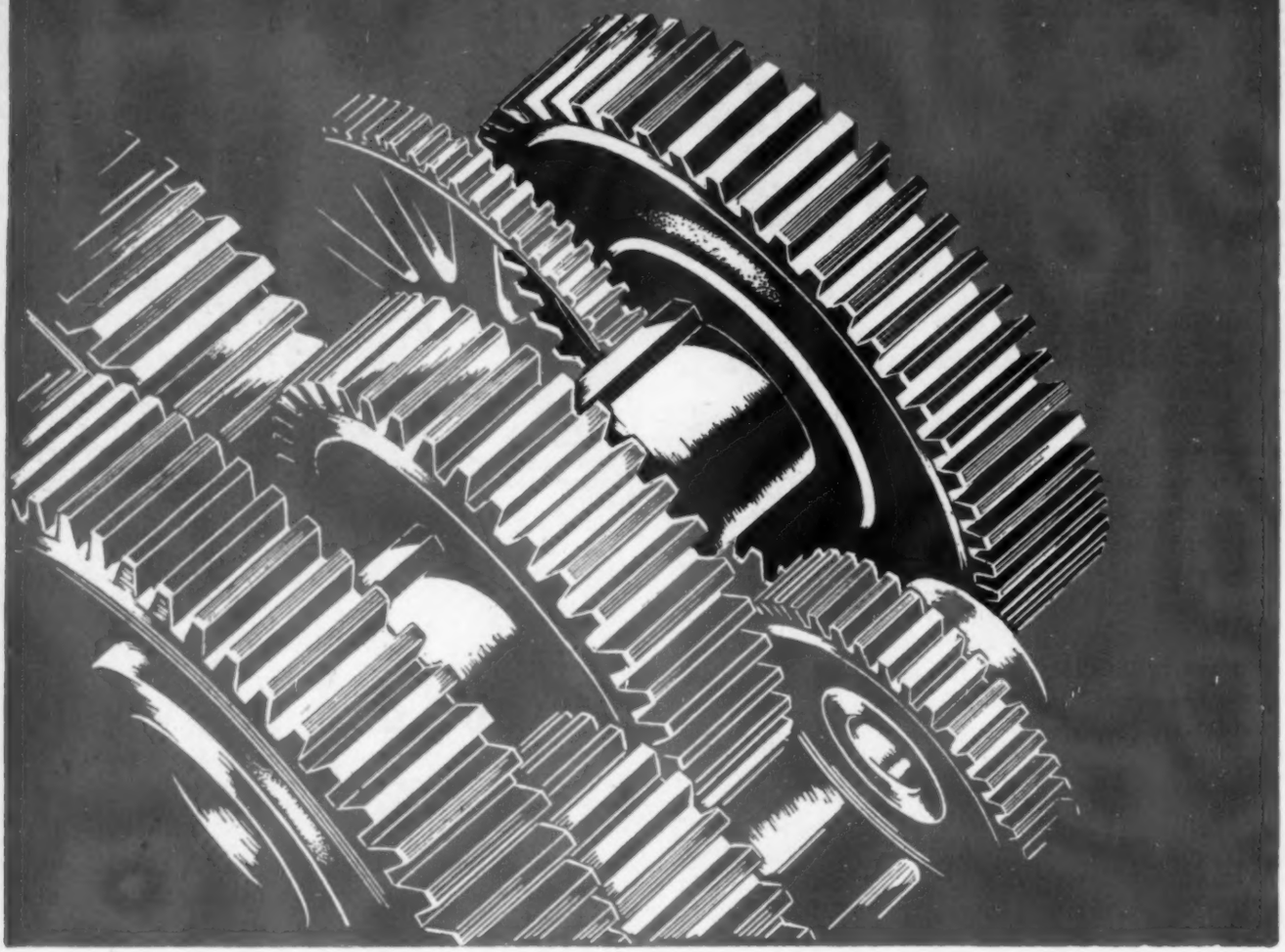
9X (SAE 10), 14X (SAE 20), 19X (SAE 30), 28X (SAE 40), 36X (SAE 40), 45X (SAE 40).

Trademarks "Calol," "Vistac," Reg. U. S. Pat. Off.

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Colo.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY NEED A STANDARD OF CALIFORNIA JOB-PROVED PRODUCT

FOR INCREASED PRODUCTION... LOWER OPERATING COSTS...



choose Tycol engineered lubrication!

TYCOL
INDUSTRIAL LUBRICANTS

**Boston • Charlotte, N. C.
Chicago • Detroit
Pittsburgh • Philadelphia
Tulsa**

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

Now more than ever before it is essential to use the best lubricants available – for maximum . . . top efficiency . . . lowest operating cost. That's why more and more operators are choosing Tycol *scientifically engineered* oils and greases.

Whatever your lubricating need – for mine car or tipple, textile loom or spindle, stationary Diesel or locomotive, steam engine or turbine . . . for extreme pressure, high or low temperature, heavy duty, high speed, or any other service condition – there's a Tycol oil or grease exactly suited to your specific need.

Let us prove Tycol *Engineered* Lubrication efficiency to you . . . show you the extra value in every measure of Tycol oil and grease. Write, or wire your nearest Tide Water Associated office for the facts.

LUBRICATION—"ENGINEERED TO FIT THE JOB"

GEARS *in the Making!*

Gears in the making—that will mean the making of the machine, wherever they are used! All sizes, all types, all materials . . . the steady stream of gears that pass through the Stahl plant are destined for jobs that are exacting in precision, or heavy duty, or both, in every industry. We are equipped to handle your gear production no matter what your requirements as to size, quantity or material. When you need big gears, accurately cut and delivered on time—get a Stahl estimate first!

STAHL GEAR & MACHINE CO.
3901 Hamilton Ave., CLEVELAND 14, OHIO

THERE'S MORE TO THIS THAN MEETS THE EYE...IT'S

Performance

To provide the maximum in gear efficiency, CINCINNATI GEARS, where needed, are ground, lapped or shaved. We can shave from 1" to 24" pitch diameter.

In thousands of applications, Cincinnati GEARS, GOOD GEARS ONLY, are proving their unique fitness in meeting engineering demands for precision and performance.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

Never Ending VIGILANCE...

Guards the Quality of every FAIRFIELD GEAR!

★ Here in the Fairfield laboratories, engineers carry on a continuous program of research . . . checking materials and methods, laboring to maintain Fairfield's enviable position as a producer of high quality gears. Their efforts are your best assurance that with Fairfield most of your gear troubles never happen.

Fairfield has a broad experience in the manufacture of gears for a wide variety of applications. Your request for information will be given prompt, professional attention.

FINE GEARS *Made to Order!*

Spiral Bevel • Straight Bevel
Hypoid • Herringbone
Helical • Differentials
Spur • Worms and Worm Gears

FAIRFIELD *For FINE GEARS*

FAIRFIELD MANUFACTURING COMPANY
307 South Earl Avenue Lafayette, Indiana

Does this ring a bell?

GEARS*

Gears—things that all machinery uses
Things that everyone abuses
Things with teeth around the rim
Sometimes fat and sometimes slim,
Things that everyone imagines
They can make.

Used to be an easy matter
Didn't mind a bit of chatter,
Then a gear with lots of noise
Didn't rob life of all joys.
'Twas no trick at all to cut 'em
As they did.

Now, gee whiz, it's different quite
Gears now have to be just right.
Even spacing, teeth O.K.,
Form, addendum, every way.
It's some trick to make 'em now
As they should.

Only those who know just how
Can make gears pass muster now.
They can make them cheaper, too,
Save a lot of cash for you.
They can show it doesn't pay
To make your own.

When the next job comes your way
Send it out without delay
To the shop with special training
So you both will share the gaining.
Gears today take expert making—
Use the best.

You can say that again!

The only way to tell whether you're getting the best is to see for yourself.

At Sier-Bath you'll see the latest gear making machines, Pratt & Whitney Grinders, Red Ring Shavers, a Gleason Gear Generator and other modern equipment. With more than 40 years' experience plus the finest gear shop in the country Sier-Bath makes the gears you want if you 'use the best'.

GEAR RANGE: Spur, helical and worm gears to 48" Dia. 3 D. P. and finer; straight tooth bevel gears 32 pitch to 3 pitch, up to 23" P. D. depending on ratio. Gears shaved from 1" to 24". Continuous Herringbone Gears generated by Sykes Method up to 37" O. D. Worms and threads precision ground on J. & L. Thread Grinder to extremely close tolerances. Spur gear grinding up to 16" diameter. Helical gear grinding up to 10" diameter. Involute and straight side splines up to 42" between centers.

Copies of this advertisement on request.

*By Loring Roper—from American Machinist, May 12, 1927

ALSO MAKERS OF SIER-BATH SCREW AND GEAREX ROTARY PUMPS

FOUNDED 1901 — MEMBER A.G.M.A.

Sier-Bath
GEAR and PUMP CO., Inc.

1344 HUDSON BOULEVARD — NORTH BERGEN, NEW JERSEY

Every Earle Gear—large or small—is expertly made to meet your most exacting requirements.

They can be cut from any practical material—are supplied in sizes ranging from inches up to 30 feet in diameter.

Each gear is accurately cut to close tolerances to assure smooth, quiet operation and better power transmission—is ruggedly built for long life.

So—if you need gears, and need them now—send us drawings and specifications for quotation. You'll get immediate attention and prompt delivery.

The EARLE GEAR & MACHINE COMPANY, *Main Offices:* 4723 Stenton Ave., Phila. 44, Pa., *Sales Offices:* 149 Broadway, N. Y. 6, N. Y.; 901 Davis Avenue, Pittsburgh 12, Pa.

EARLE GEARS

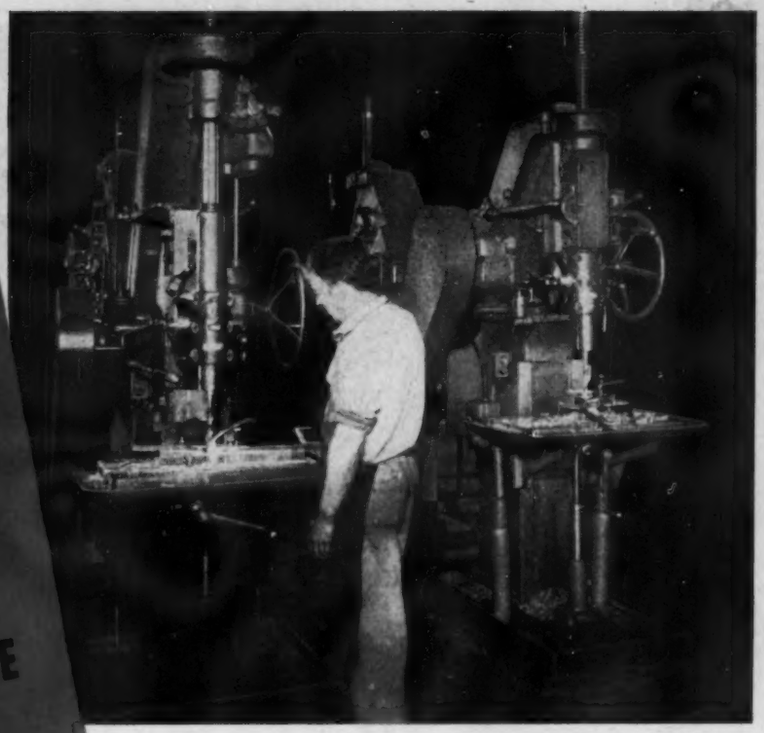
SPUR • BEVEL • WORM • SPIRAL • CONTINUOUS TOOTH HERRINGBONE • SPROCKETS • RACKS • ETC.

Grand Rapids No. 4 Universal Cutter and Tool Grinder

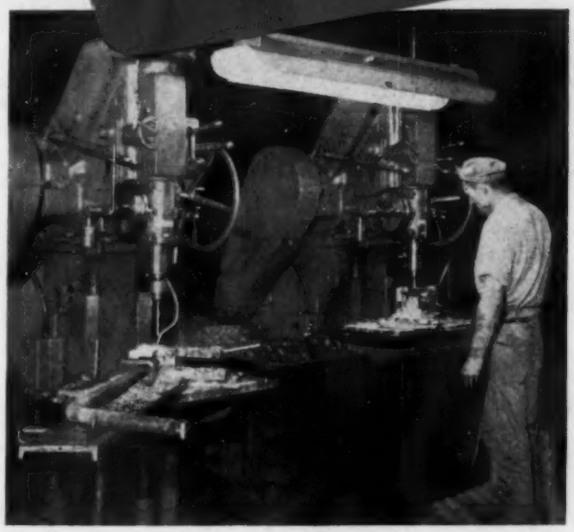
The extreme flexibility and versatility of the Grand Rapids Universal Cutter and Tool Grinder makes ordinarily complicated grinding operations really practical, convenient, simple and fast.

Write for Bulletin 1045

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.



Drilling operation on No. 221½ Standard Drilling and Tapping Machine. Reaming operation on No. 262 Sliding Head Machine.



High Production Drilling Operations on No. 221½ Standard Drilling and Tapping Machines

ON BARNESDRIL MACHINES

DRILLING • REAMING • TAPPING FARM IMPLEMENT PARTS

● If you could save 30% in production time — gain 75% longer drill life — on high production drilling, reaming and tapping operations in hard steel parts and castings, this would be an important production advantage, wouldn't it? Such efficiency would help you reduce costs, reflecting in lower selling prices, and result in higher earnings per operator.

This has recently been the experience of one farm implement manufacturer who selected BARNESDRIL Standard Drilling Machines for high production operations, over other equipment in the same price class. Production dividends resulted because BARNESDRIL Machines have larger, sturdier spindles, direct spur gear driven feeds, and all-geared speeds.

BARNESDRIL Standard Drills also have easily selected fast- and-slow feeds and speeds which provide trouble-free, rapid change-over on the job. Other important design features, auxiliary heads, and special fixtures and tooling offer specific production advantages. Complete information is contained in these bulletins.

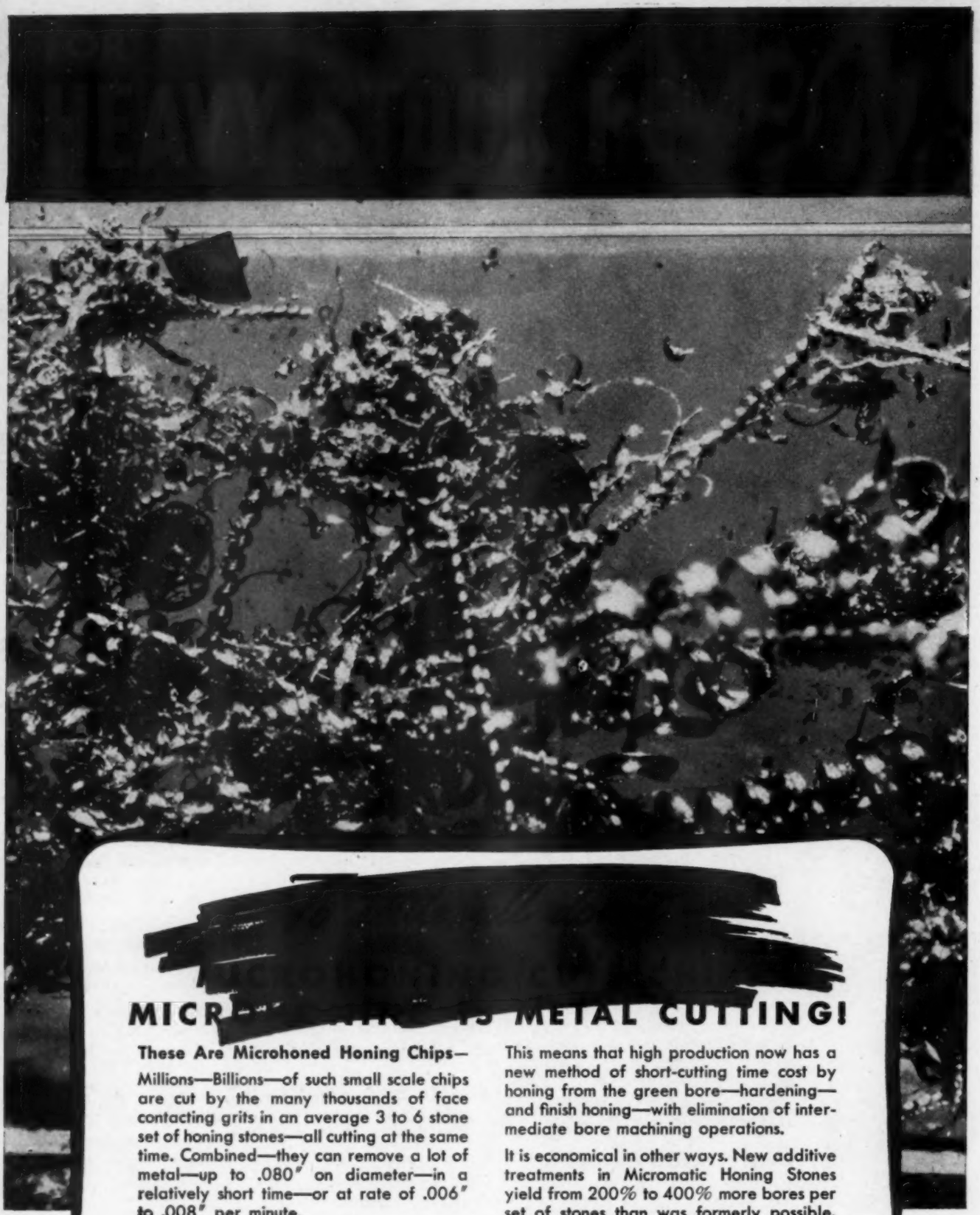
STANDARD DRILLS CATALOG B-3474

TOOLING & FIXTURES BULLETIN B-34

Write for your copies now!

BARNES DRILL CO.

830 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.



MICR[illegible] METAL CUTTING!

These Are Microhoned Honing Chips—

Millions—Billions—of such small scale chips are cut by the many thousands of face contacting grits in an average 3 to 6 stone set of honing stones—all cutting at the same time. Combined—they can remove a lot of metal—up to .080" on diameter—in a relatively short time—or at rate of .006" to .008" per minute.

This means that high production now has a new method of short-cutting time cost by honing from the green bore—hardening—and finish honing—with elimination of intermediate bore machining operations.

It is economical in other ways. New additive treatments in Micromatic Honing Stones yield from 200% to 400% more bores per set of stones than was formerly possible.

MICROMATIC HONE CORPORATION • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, Cal. • 194 Dalhousie St., Brantford, Ont., Can. • 616 Empire Bldg., 206 S. Main St., Rockford, Ill. 501 Harries Bldg., 137 No. Main St., Dayton 2, Ohio • 927 A—M & M Bldg., P.O. Box 981, Houston 2, Texas • Room 516—129 Church St., New Haven 10, Conn.

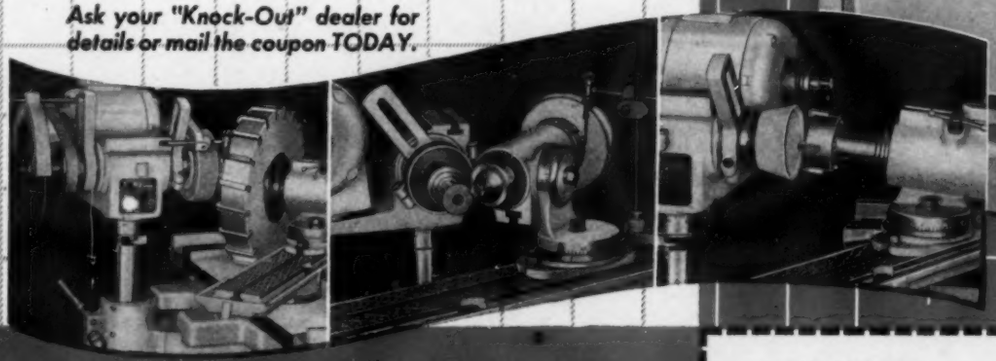
Tool Maintenance Costs Come Down...

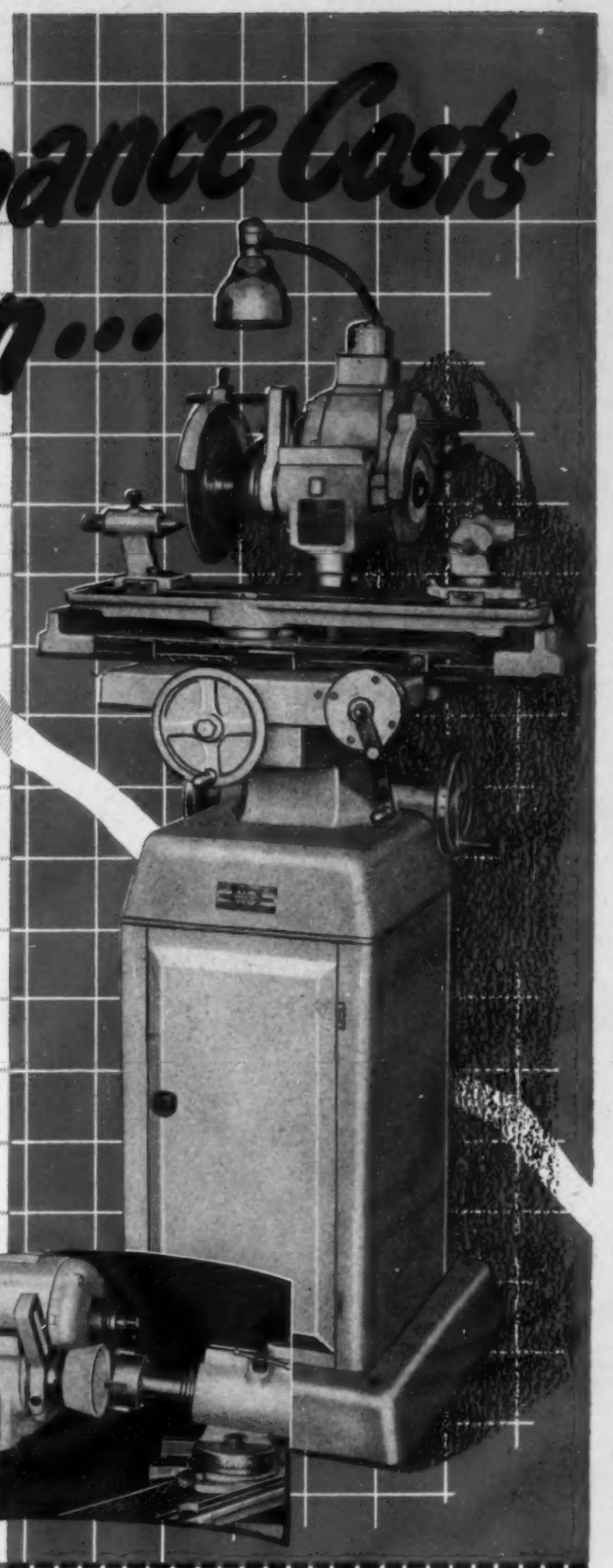
WHEN YOU USE A "KNOCK-OUT" Universal Cutter Grinder

Tool Maintenance Costs Come Down when you use a "Knock-Out" Universal Cutter Grinder.

Set-ups are simpler, easier to make—less time is lost between jobs—more tools of all types can be properly reconditioned at less cost with a "Knock-Out" Universal Cutter Grinder. Handles internal, external and surface grinding too. A "Knock-Out" Universal Cutter Grinder is the busiest machine in *any* Tool Room.

Ask your "Knock-Out" dealer for details or mail the coupon TODAY.





K.O. LEE CO.

ABERDEEN, SO. DAK.

MANUFACTURERS OF MACHINE TOOLS AND AUTOMOTIVE MAINTENANCE EQUIPMENT

K. O. LEE COMPANY
1111 First Ave. S. E., Aberdeen, S. D.
Please send us complete details on "Knock-Out" Universal Cutter Grinders.

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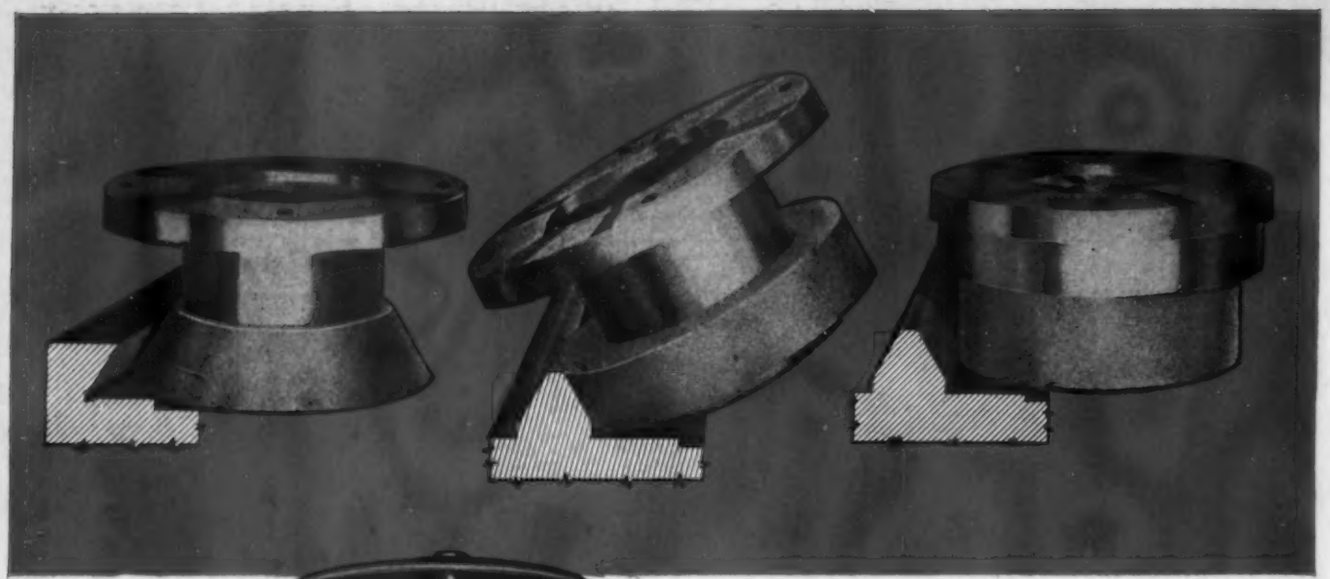
ADDRESS_____

CITY_____ STATE_____



Versatile IS THE WORD FOR THIS POPE MOTORIZED GRINDER SPINDLE . . .

Every user is enthusiastic about the performance of this powerful Spindle with *sealed-in* lubrication and totally enclosed, fan cooled motor. It has the bearing capacity and the rigidity to *rough off surplus metal fast* and produce superior final finishes as well.

As you see, it may be equipped with a wide flange spindle nose for *quick mounting* of various types of grinding wheels or other tools which are readily attached by easy-to-get-at screws. No fumbling around for blind holes.

This useful and popular Spindle comes in 3, 5 and 10 HP, 1200, 1800 and 3600 RPM. Other HP's and speeds are available on special order. Write for Data Sheets 16, 17, 18 and 19.

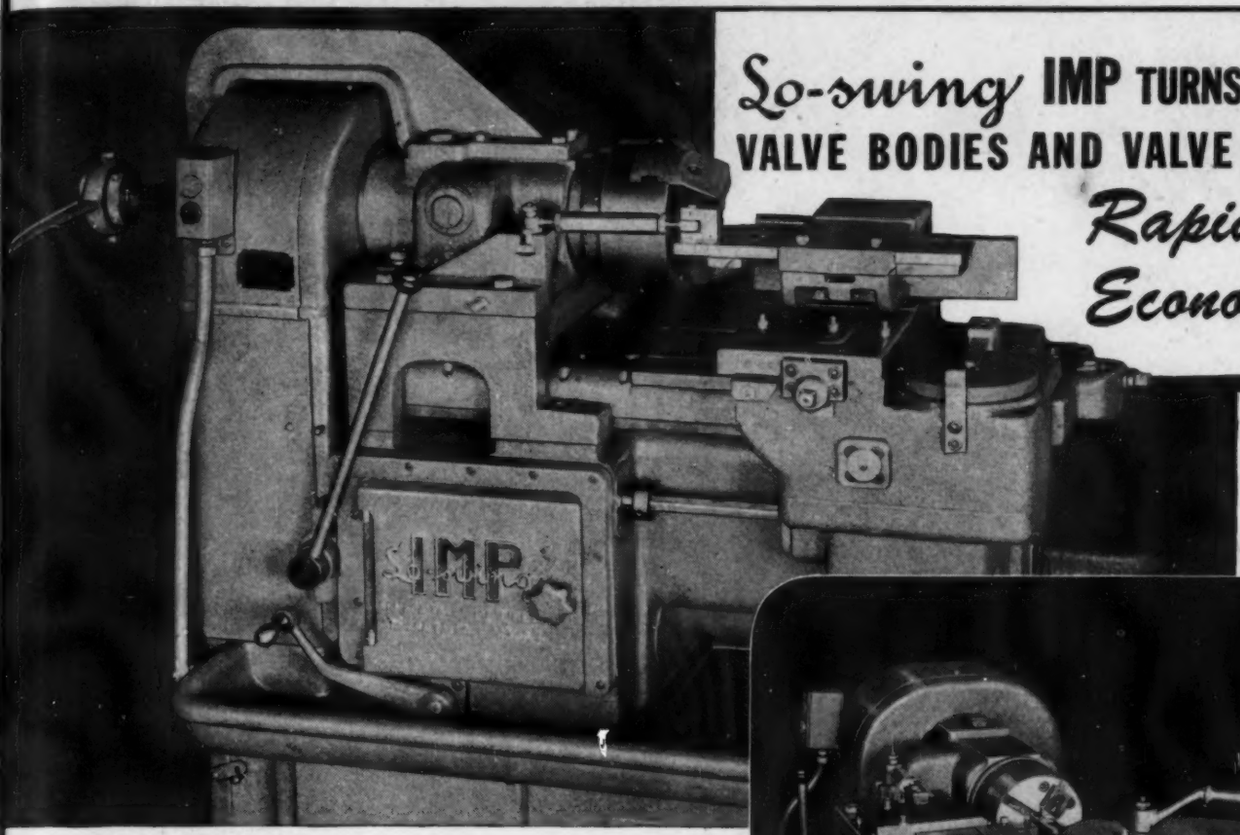
No. 42

POPE

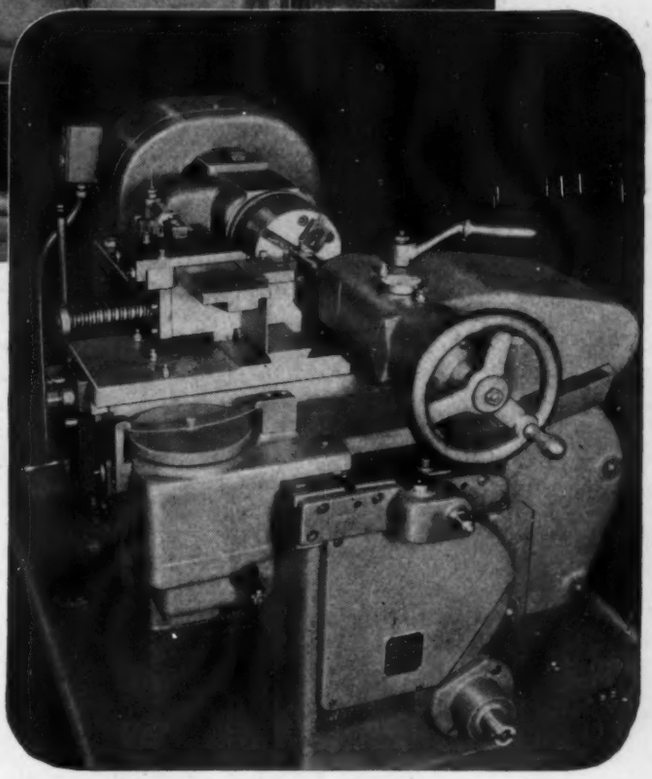
POPE MACHINERY CORPORATION
ESTABLISHED 1920
261 RIVER STREET · HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



Lo-swing IMP TURNS AND FACES VALVE BODIES AND VALVE KEYS . . . *Rapidly and Economically*



Problem: To taper bore and back face the Valve Body and taper turn the Valve Key.

Solution: Lo-swing IMP Lathes were selected for both operations because its spindle bearings permit high spindle speeds required for turning bronze alloy and its carriage design assures unusual turning accuracy and provides protection for the ways of the bed which are completely covered at all times.

Illustration above shows the equipment for taper boring the Valve Body and facing the small end. The boring bar is controlled by an adjustable template clearly shown in the illustration. The piece is rough bored with a coarse feed on the forward stroke and finish bored with a fine feed on the return stroke. The cross slide cam automatically feeds in the tool .005" on the return stroke. The end facing operation is made with a special tool holder located in the headstock spindle bore. The operation consists of clamping the pieces in the chuck, the operator then pulls the starting lever and the facing tool lever, after which the rest of the operation is entirely automatic.

Close-up illustration at right shows the equipment for taper turning the Valve Key. The turning tool in this operation is also controlled with an adjustable taper template and the key is rough turned on the forward stroke and finish turned on the return stroke by the same method employed for the boring of the Valve Body. The operation consists of loading the piece between centers and pulling starting lever, the remainder of the operation is entirely automatic.

Let Seneca Falls Engineers help you solve your machining problems.

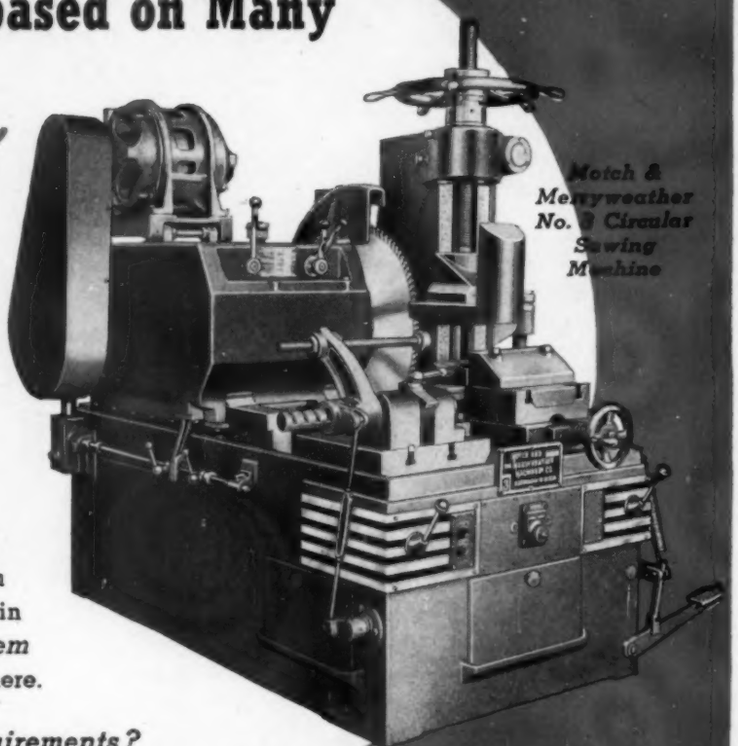
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

Only from Motch & Merryweather can you get Engineering Service based on Many Years devoted to

"Building All 3"

A range of Triple-Chip circular sawing machines for work up to 16½", handling iron, steel, aluminum, brass, bronze, magnesium and other materials. A range of Triple-Chip saw blades from 8" to 70" diameter (smaller sizes for milling and slitting, too). Three Triple-Chip blade sharpening machines which give the necessary cam-generated tooth form. A staff of sales engineers equipped by training and experience to consult with you for your profit. An unparalleled experience in building "all three" and *making them produce*. The answers, sir, are here.



Motch & Merryweather No. 3 Circular Sawing Machine

What are your sawing requirements?

Only M. & M. builds ALL 3: CIRCULAR SAW, SAW BLADE, BLADE GRINDER

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO

The steel washing machine tub above, drawn from its 35½" blank, is an example of a difficult drawing operation solved by the use of Bonderizing as an aid in drawing.

Bonderizing builds on the work, by chemical reaction, a protective surface of nonmetallic crystals. These crystals, integral with the metal, are stretched and crushed between the dies, but remain an effective cushion through the drawing operation. Faster, deeper draws are possible, with almost no scoring and tearing, fewer rejects, less wear on punches and dies.

Savings through faster production, less waste, and longer die life are real and substantial in almost every case. Send for your copy of the FREE technical bulletin, "Bonderite* As An Aid In Drawing." It may save *you* money, too!

*Reg. U. S. Pat. Off.

PARKER RUST PROOF COMPANY • 2196 East Milwaukee Avenue, Detroit 11, Michigan

BONDERIZING Holds Paint to Metal
PARKERIZING Inhibits Rust
PARCO LUBRIZING Retards Wear on Friction Surfaces

PARKER PRODUCTS CONQUER RUST

the right line for the right blade

THE Star line is the right line because it's *really complete.* At your Star supplier you'll find a blade for every job a hack saw or band saw can do. In addition, you'll get the *right* blade because your Star supplier is backed by *a complete line* of blades that have *proved faster, longer wearing,* in cutting metals, plastics, and other non-metallics. So, add it up any way you like, Star blades, frames and band saws, amount to *more* economy, *more* convenience, and *more* satisfaction. Yes, you can't go wrong when you see your Star supplier—he has the right line, the right saw *for you.* It's Star.

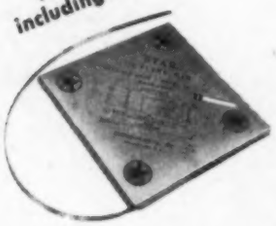
This booklet is packed with facts on saw selection, use, care — prices, too. Get your copy from your Star supplier . . . it's free.

• HAND BLADES

• POWER BLADES

• FRAMES

• BAND SAWS (Metal Cutting, including Skip-tooth)



Sold only through recognized distributors

CLEMSON

CLEMSON BROS., Inc., Middletown, N. Y.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson D-17 lawn machine.

2104

A *Correct* DRILL POINT for FULL PRODUCTION

The OLIVER 510 DRILL POINTER

Most drilling operations performed are exacting —deep holes in solid metals—coarse feeds and high speeds that test the quality of tools and machines.

The Oliver Drillpointer sharpens 2, 3 and 4 lip drills from ¼ to 3". It automatically provides maximum backing for the cutting edge and abundant clearance in front of the cutting part of the chisel point—less dead center and more cutting point.

OLIVER OF ADRIAN PRODUCTS

Send us a few drills, we'll show you a better sharpened tool — no obligation.

OLIVER INSTRUMENT CO.

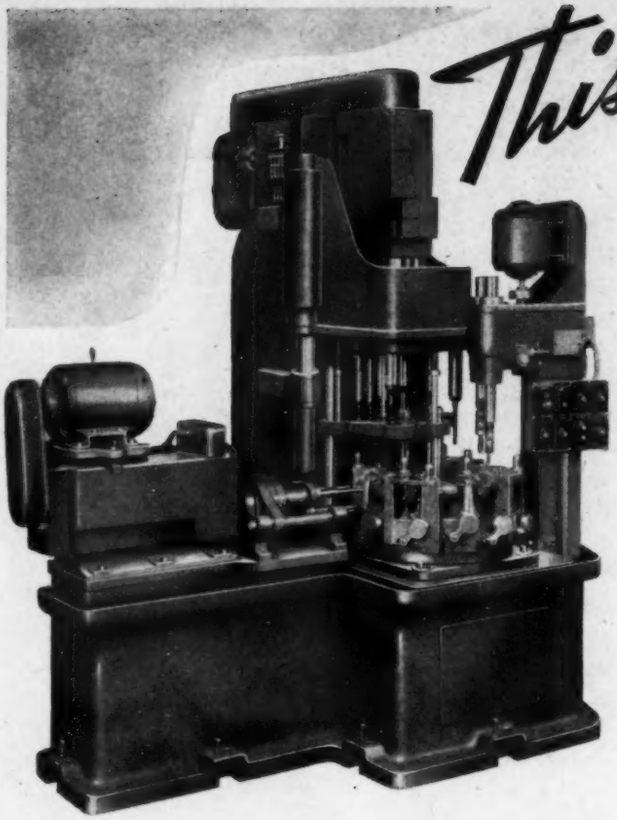
1414 E. Maumee St.
Adrian, Michigan

Send for Illustrated Literature

IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION

OLIVER OF ADRIAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DUPLICATING MACHINES



This "STANDARD" MACHINE DRILLS 7 HOLES— TAPS 2 HOLES— COUNTERBORES 3 HOLES *at once!*

THE *Robbins* No. 3 Drillmatic

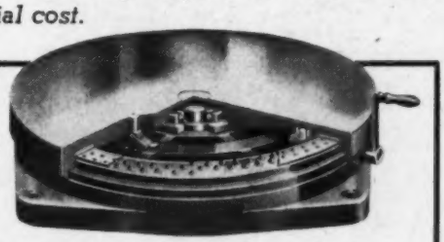
Designed and built for special purpose adaptations *at lower cost*

The job shown above is a typical adaptation of the Robbins No. 3 Drillmatic. Designed and built as a standard machine expressly for special purpose adaptations, it is readily applied to a wide variety of production operations at lower initial cost. And when operations are changed, the No. 3 Drillmatic can be converted to the new job.

Work heads with any number of spindles are mounted on the tooling saddle, using the locating and hold-down holes provided. Auxiliary units, similar to the boring and tapping units in this application, may be attached to the base at any position and at any angle from vertical to horizontal.

Robbins engineers will gladly consult with you on the applications for the No. 3 Drillmatic in your plant. And with over 17 years' experience designing and building special tools and machinery, they are qualified to produce tooling for this economical machine that will do your job faster and better, *at lower initial cost.*

THE *Robbins* INDEX TABLES



Robbins Index Tables are available in sizes from 18" to 52" for hand indexing, as shown, or hydraulic power indexing as used above. Hand table is located by hardened and ground index pin which engages in bushings in table. Number and location of bushings is determined to suit application. Table indexes in one direction only . . . important safety factor. Table revolves on two ball-type bearings—one in center of table, one on outer diameter . . . effortless indexing, maximum vertical thrust support. Outer bearing has large number of balls, staggered to travel in separate arcs on hardened races . . . no brinelling.

Fully illustrated catalogs contain complete details on both these products. *Write to Robbins Engineering Company, 318 Midland Ave., Detroit 3, Michigan.*

Robbins
ENGINEERING COMPANY

Producers of ROBBINS MAGNA-SINE • ROBBINS UNIV-ANGLE ROBBINS SINE PLATE • ROBBINS INDEX TABLES ROBBINS No. 3 DRILLMATIC • SPECIAL MACHINERY

PREFERRED FOR PRACTICAL REASONS

STA-KOOL

TOOL HOLDERS

30 to 50% Longer Tool Life is obtained with the JKS STA-KOOL Tool because of its internal ducts and fins which permit quantities of coolant to circulate in and around the setting. Temperature is thus kept well below the danger line, increasing diamond life. Available for practically all makes of machines.

SMITITE

DIAMOND TOOLS

Resetting Costs are Eliminated in straight dressing operations with the use of JKS SMITITE Tools. Carefully selected, small stones are set for life in matrix that slowly wears away with the diamonds. Fresh cutting edges are always obtainable by a simple turn of the tool, until the diamonds are entirely consumed.

For further information on the above tools or the complete JKS line of diamond tools, write

J. K. SMIT & SONS, Inc.

157 Chambers St., New York 7, N. Y.
6400 Tireman Ave., Detroit 4, Mich.

5029

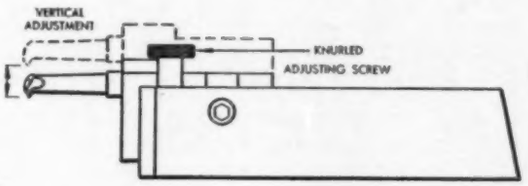
YOU RESHARPEN ONLY ONE FACE of BOKUM TOOLS

Thus the original form of these boring and internal threading tools is never changed. The angle of the cutting edge and the special helical backed-off form of the front of the tool (A and B) produce a free cutting action that is constantly retained — even through resharpening.

Send for folders that show complete range of sizes. Choose the tool you require and try it on your machines. See how much faster and more economically Bokum Tools perform.

K-1139 gives information on super high speed tools and K-398 on carbide tipped tools.

THIS NEW HOLDER GIVES YOU VERTICAL ADJUSTMENT



Send for Catalog

A simple turn of knurled screw on top of holder moves tool in vertical plane to give the precision setting you want. Rocker of tool post can be left out and shims are not needed. Here is a worthy advancement in boring tool holders. Two sizes: BT-0 shank size 3/8" x 1", BT-1 shank size 1/2" x 1 1/4".

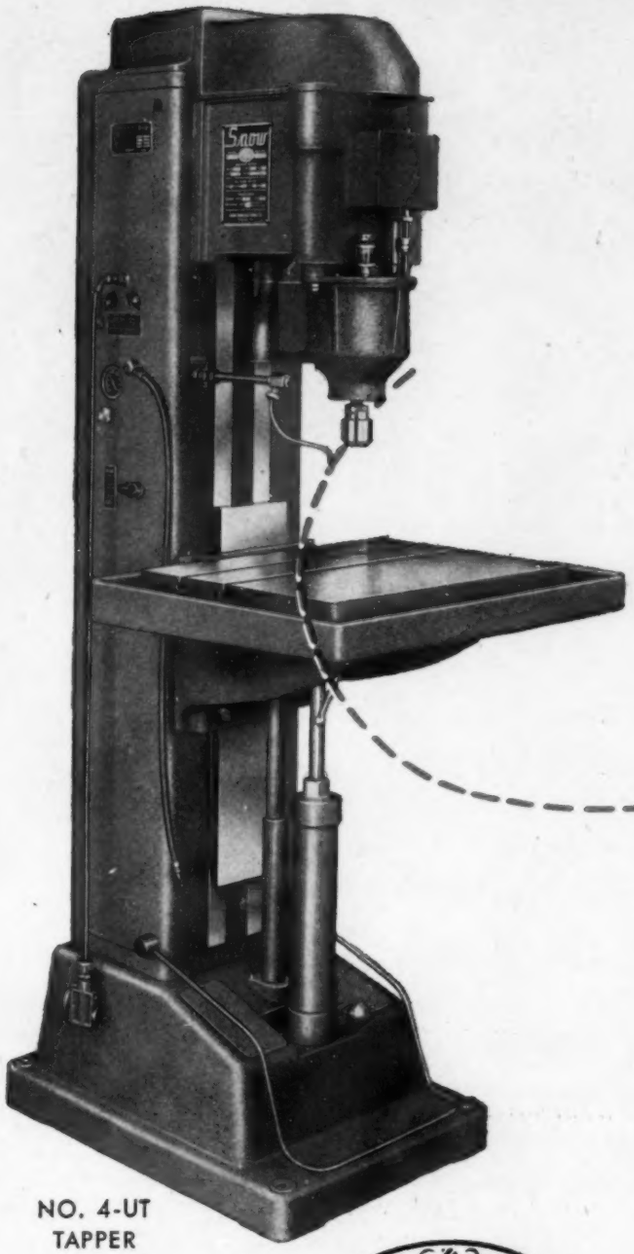
BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

AIR OPERATED • ELECTRICALLY CONTROLLED

FUNCTIONS *three* WAYS



NO. 4-UT
TAPPER

the *basic* SNOW AIR TOOL

Time-tested, quality-proven, thousands have been put into use in the past sixteen years. The Snow Air Tool — fundamental tool around which are built—the Snow Tapping Machine, the Snow Drilling Machine, the Snow Threading Machine.

Air operated—electrically controlled, it includes the latest in design. Quick-acting automatic holding fixtures are made fully automatic, semi-automatic or manually operated—all by the turn of a switch.

Send prints or sample parts for production estimates and for quotations. Or write for catalog.

TOOL
Snow
SNOW MANUFACTURING CO.
617 SOUTH CALIFORNIA AVENUE
CHICAGO 12 • ILLINOIS

Get a Head Start with

JESSOP *Standard*

"MALTA" CARBIDE TOOL TIPS

JESSOP'S Standard Malta Carbide Tool Tips will enable you economically to take care of many of your carbide tool requirements in your own shop. Simply mill or grind recess in your tool shank, braze in the MALTA tip, grind, and you are off to a head start for increased production.

Remember, too, that JESSOP standard Malta Carbide Tool Tips will produce more parts per hour and give longer life between grinds, as well as an improved finish to the part. Six standard grades are available—three for general purpose and three for special purpose work—to take care of the majority of your machining operations.

Write today for the JESSOP catalogue on "MALTA" Carbide tool tips, tools, dies, and wear resisting parts.

JESSOP STEEL COMPANY • SPECIALTY STEELS •

JESSOP STEEL COMPANY

WASHINGTON, PENNSYLVANIA

Tailor-made Specialty Steels

Illustration of die milling by courtesy of the Bischof Die and Engraving Company of Racine, Wis.

BUT... GORTON *Tracer Controlled Milling* DID THE JOB

A Gorton Super-Speed Tracer-Controlled Milling Machine with adjustable ram together with a super-speed spindle made it possible to mill to a depth of 1/2" with a 1/16" dia. cutter (producing thin wall in finished die casting; see arrow). This was for the main frame for a vibrating hand massager manufactured by the John Oster Manufacturing Company of Racine, Wis. Only one Master model was used to mill a two-cavity die casting die with a minimum of hand finishing—this is typical of Gorton Tracer-Controlled equipment.

If you are interested in die and mold work, production profiling, super-speed milling, engraving, graduating, contour grinding or electric etching of hardened parts, let . . .

GORTON PRE-DETERMINE RESULTS FOR YOU

Mail us complete description with prints of your job. Gorton engineers will furnish you with a production estimate of it tooled on a Gorton—no obligation.

THE JOB IN BRIEF

- *Job:* Mill 2-cavity die casting die from single soft master.
- *Material:* Hot formed die steel.
- *Machine:* Gorton 8 1/2-D Super-Speed Duplicator.
- *Method:* Two machine settings per cavity without resetting work.
- *Cutters:* Gorton single flute; minimum dia., 1/16"; maximum depth of cut, 1/2".
- *Spindle Speeds:* Roughing, 250 r.p.m.; finishing, 6000 r.p.m.
- *Limits:* .002" with minimum hand finishing.

PLEASE SEND WITHOUT OBLIGATION
Bulletin No. 1655-1504

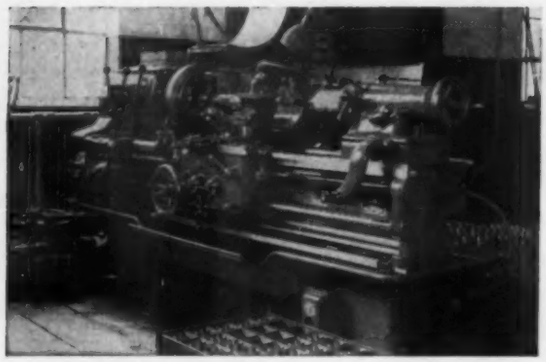
Name.....
Company.....
Position.....
Address.....
City.....*Zone*....*State*.....

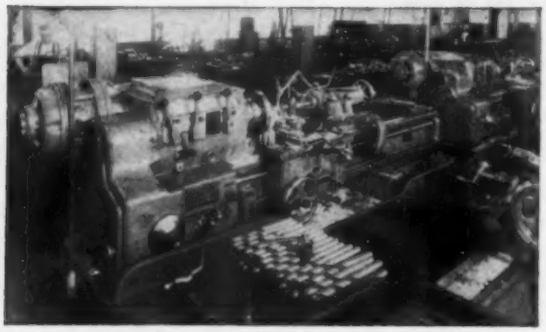
Send for Bulletin 1655 on Tracer Control—use handy coupon at right—today!

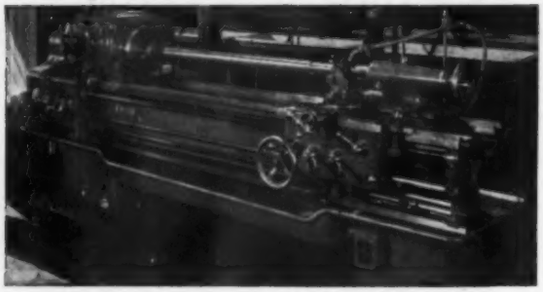
GEORGE GORTON MACHINE CO.
Tracer Controlled Milling
1504 RACINE STREET • RACINE, WISCONSIN, U. S. A.

When you need our help in a hurry . . . DON'T WRITE, PHONE Jackson 417

For Speed, Economy and Range
THE HENDEY 4C MANUFACTURING LATHE







The Hendey 4C Manufacturing Lathe is fast, precise and economical. It is capable of handling a wide range of turning, boring and threading jobs on either a long or short run basis. The 4C is functionally designed to make operation simple. A unique change gear train provides a maximum of feeds and speeds with the minimum number of controls. The use of selected materials, plus the precise testing of all parts and assemblies in the 4C, insures smooth, accurate production. All gears are made of hardened alloy steel, machined and shaved to the closest tolerances. The spindle rides in selected super-precision preloaded bearings. Ample provision for fast stopping and starting is furnished by a large multiple disc clutch and a cone brake. And, of course, the 4C has a Hendey precision lead screw accurate to ± .001" per foot of lead. The spindle collar is accurately graduated to make multiple threading easier. Also the 4C has an automatic lubrication system that practically eliminates the maintenance problem.

In fact, *if you want a manufacturing lathe that has the rigidity, sensitivity and accuracy to produce work ranging from long shafts to twist drills with speed and economy, you need look no further than the Hendey 4C. Write for complete information today.*

The Hendey Machine Company

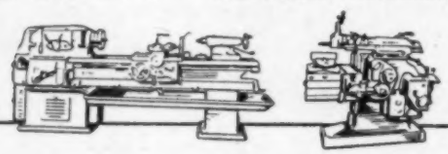
Hendey

Main Office and Plant — Torrington, Connecticut

Offices — N. Y., Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

Representatives in — Philadelphia, Cleveland, Pittsburgh

TOOL ROOM LATHES
12" - 14" - 16" - 18" - 20"



SHAPERS
12" - 16" - 20"

MAGIC TYPE

QUICK-CHANGE CHUCKS

1-2-3 Changed!

1 LOCKING RING

2 DROP OUT TOOL

3 INSERT OTHER TOOL

Turret Tapping Machine!

Save set-up time with this "Magic" Quick-Change Chuck. Presto-Change-O, you change tools in your Drill Presses, Vertical Tapping and Boring Machines... insert Drills, Reamers, Boring Bars, Counterbores, Core Drills, Taps or Special Tools, without stopping spindles!

When you raise locking ring, collet drops out automatically for a quick, safe tool change. Four styles of collets available —"AA", "A", "D" and "E" to accommodate various tools. Adds many stations to your machines.

Consult our engineers on adapting "Magic" Quick-Change Chucks and Collets to your production problems. Send us your sketches or blue prints for recommendations and quotations.

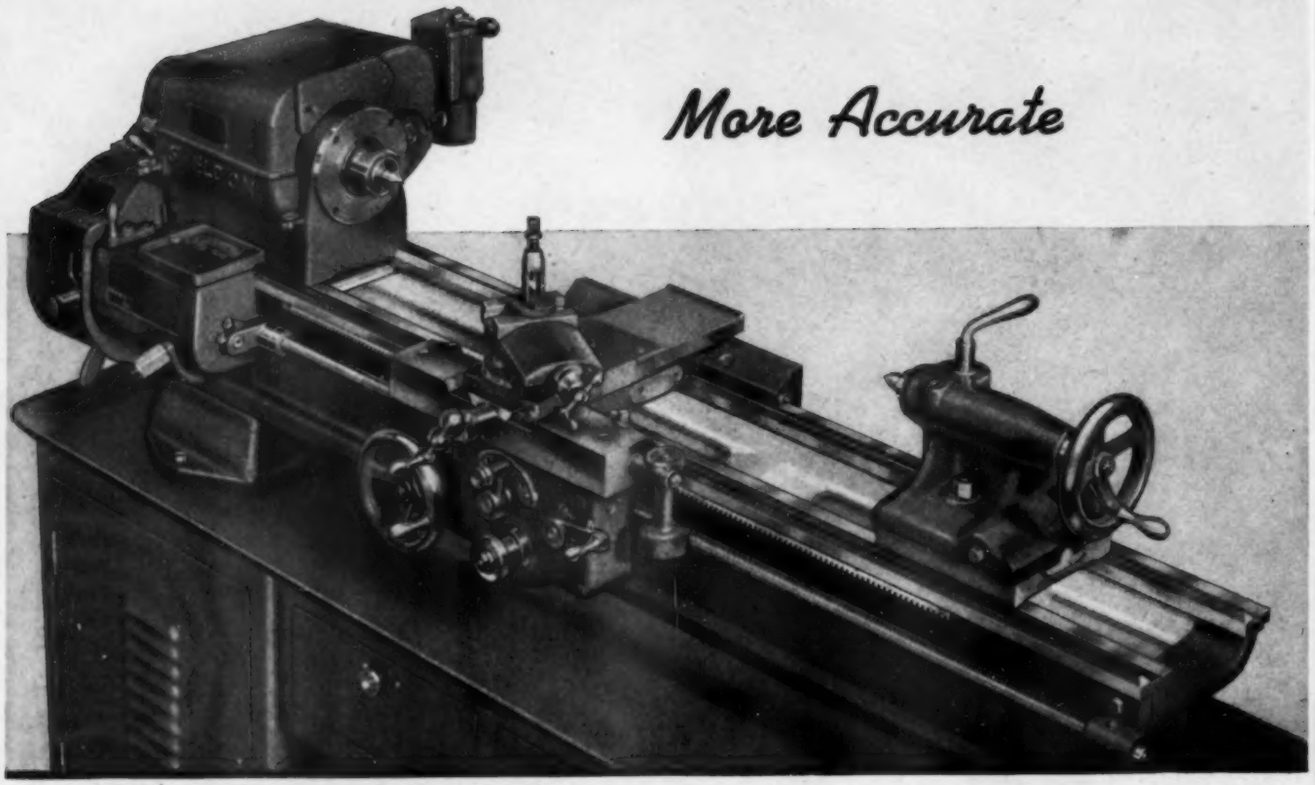
A good stock of Quick-Change Chucks is maintained from which requirements for most sizes can be filled immediately. See pages 98-102 of Scully-Jones Catalog No. 500.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

2140

1902 SOUTH ROCKWELL STREET • CHICAGO 8, U.S.A.



More Accurate

SHELDON
New TRB-S56
Precision Lathes

There is a degree of accuracy built into the new $1000.00 Sheldon TRB-S56 Precision Lathe heretofore found only in a few of even the most costly lathes. For example, spindle bearings are "zero Precision," the very finest, closest tolerance tapered roller bearing manufactured. The heavily strutted, 1-piece bed has 2 V-ways and 2-flat ways ground on special bed grinder and held to the closest tolerance of lateral and parallel alignment. The lead screws are milled on the most accurate special lead screw milling machine.

In the Sheldon TRB-S56 modern engineering, extensive tooling combined with the finest special machinery—a modern machine tool plant with modern equipment, modern manufacturing methods—give this small (11¼" swing, 1" collet capacity, 56" bed, 8 speed—50 to 1350 r.p.m.), convenient, moderate priced lathe, the permanent accuracy and features, heretofore found only in more cumbersome and costly lathes.

Write for circular

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

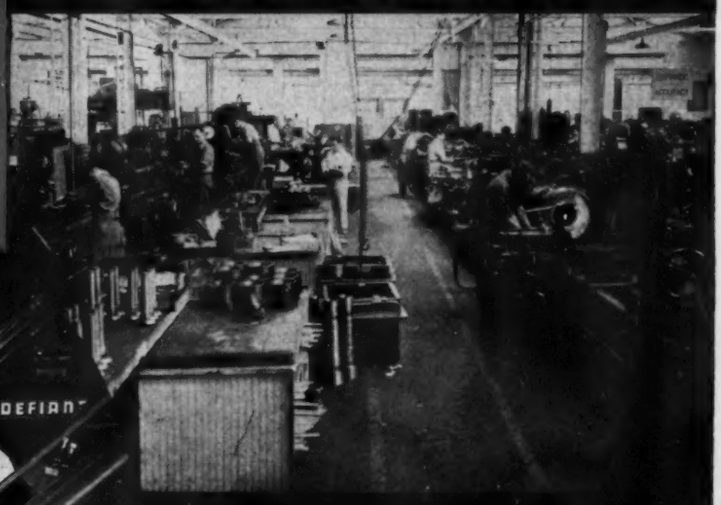
4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

Equipped to build quality

Equipment at Defiance "sets the stage" for accurate, quality workmanship in all departments! Machines are kept scrupulously clean. Entire plant layout keeps work flowing smoothly and efficiently.

Extreme care in every detail of production assures that Defiance Machines for boring, milling, drilling and tapping are soundly built . . . accurate to specifications of sound engineering. Backed by 97 years of precision manufacturing . . . built to help you *produce more*, with *greater accuracy* and *lower costs*. Defiance Machine Works, Inc., Defiance, Ohio.

Center Section Main Assembly



Grinders and Heavy Lathes

Eight of these Defiance Machines in a series handle machining of valve holes and inserts in the manufacture of V-Type motors. A job demanding *accuracy* in a difficult set-up!

Turret Lathes and Screw Machines

DEFIANCE

BORING . . . MILLING . . . DRILLING
TAPPING MACHINES

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

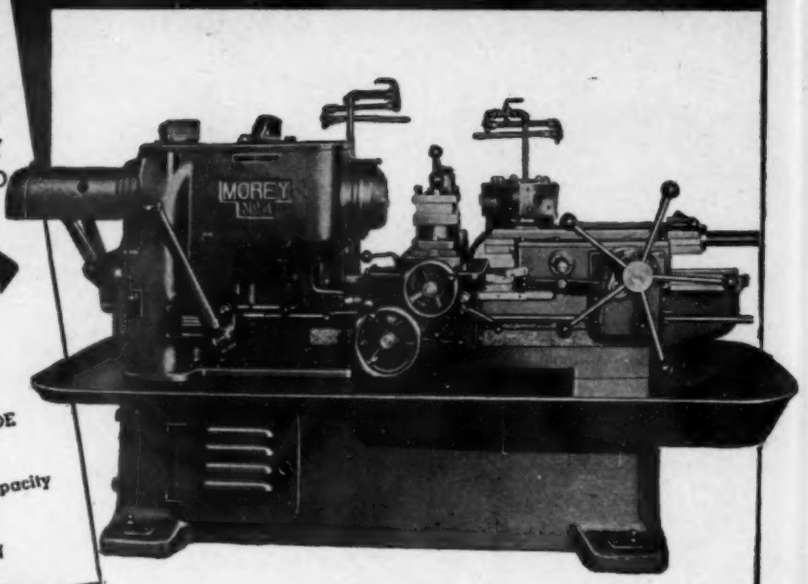
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity

ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

• BORING—rough, semi-finish and finish • MILLING (special types) • STRAIGHT LINE DRILLING • UNIVERSAL ADJUSTABLE SPINDLE DRILLING • HONING • TAPPING • REAMING • COUNTERBORING • VERTICAL AND WAY-TYPE EQUIPMENT

then a Moline Multiple Spindle Specially Designed machine tool is your answer. Moline tools are ruggedly built and engineered to fit your PARTICULAR requirements, they're made to last for years, they're easy to change over to other jobs, they do better work at less cost and stand up to it longer.

For YOUR special problem, go "HOLE-HOG," write us for any information you may need.

MOLINE TOOL CO.
HOLE-HOG
MOLINE, ILLINOIS

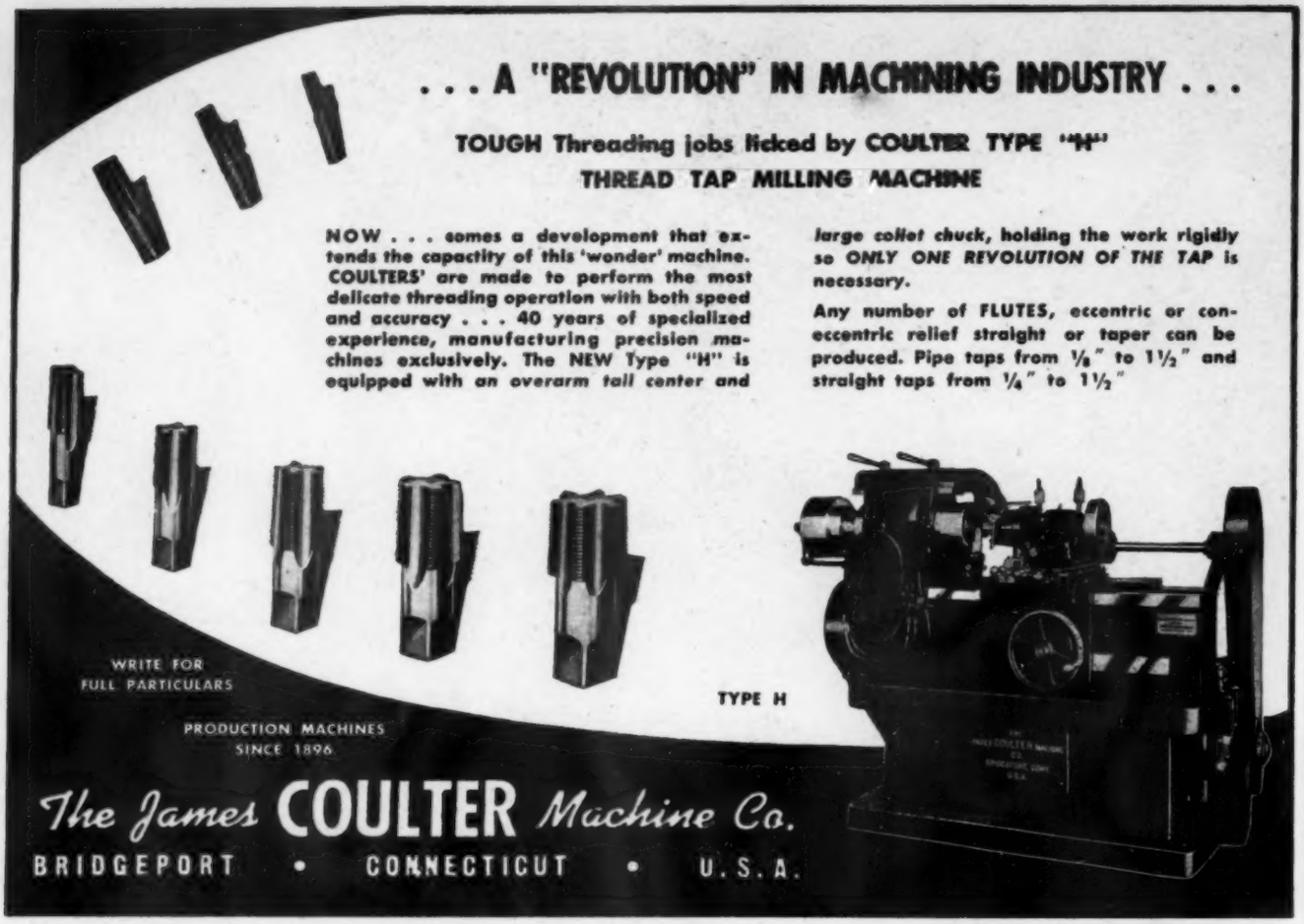
MOLINE TOOL CO.
100 20th Street Moline, Illinois

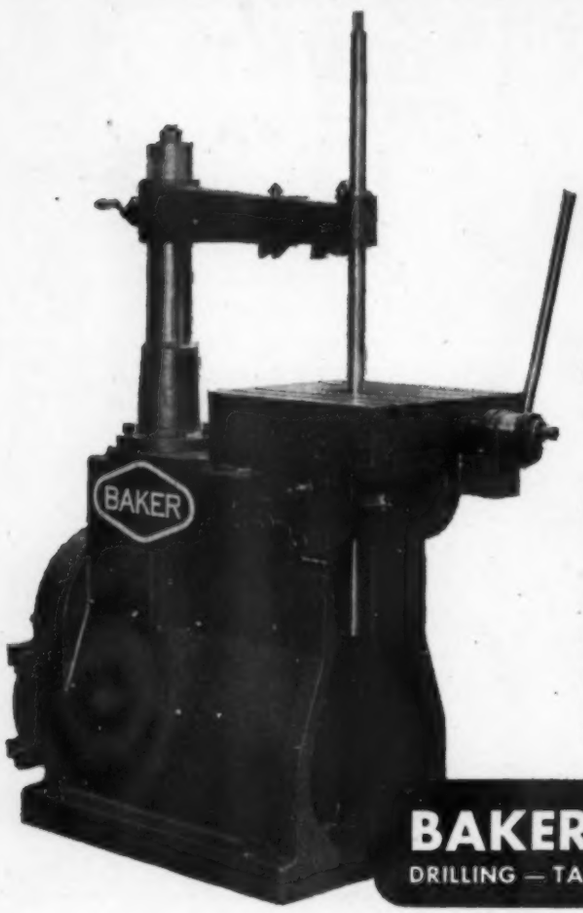
Flat circular work requiring perfect parallelism . . . extreme flatness . . . exact thickness . . . with a particular degree of finish required. This is an easy job for ARTER Model B Rotary Service Grinder. ARTERS are versatile. There is a machine for your work.

Ask us to tell you about it.

ARTER GRINDING MACHINE CO.
WORCESTER 5 MASSACHUSETTS, U.S.A.

HOW TO UP PRODUCTION
MOUNTED
WHEELS — POINTS
The Bay State line contains "points" you cannot afford to overlook. They are made from solid blank forms and are shaped, trued, and sized on special lathes *after* mounting on steel mandrels. They are thus automatically pretested to make certain that the wheels and points are truly "stuck for life" to the mandrels.
Branch Offices and warehouses
Detroit — Chicago
Distributors — All principal cities
BAY STATE
Top Performance Consistently Duplicated
BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.


. . . A "REVOLUTION" IN MACHINING INDUSTRY . . .
TOUGH Threading jobs licked by COULTER TYPE "H"
THREAD TAP MILLING MACHINE
NOW . . . comes a development that extends the capacity of this 'wonder' machine. COULTERS' are made to perform the most delicate threading operation with both speed and accuracy . . . 40 years of specialized experience, manufacturing precision machines exclusively. The NEW Type "H" is equipped with an overarm tail center and large collet chuck, holding the work rigidly so ONLY ONE REVOLUTION OF THE TAP is necessary.
Any number of FLUTES, eccentric or concentric relief straight or taper can be produced. Pipe taps from 1/8" to 1 1/2" and straight taps from 1/4" to 1 1/2"
WRITE FOR FULL PARTICULARS
TYPE H
PRODUCTION MACHINES SINCE 1896
The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.



BAKER

KEYSEATER

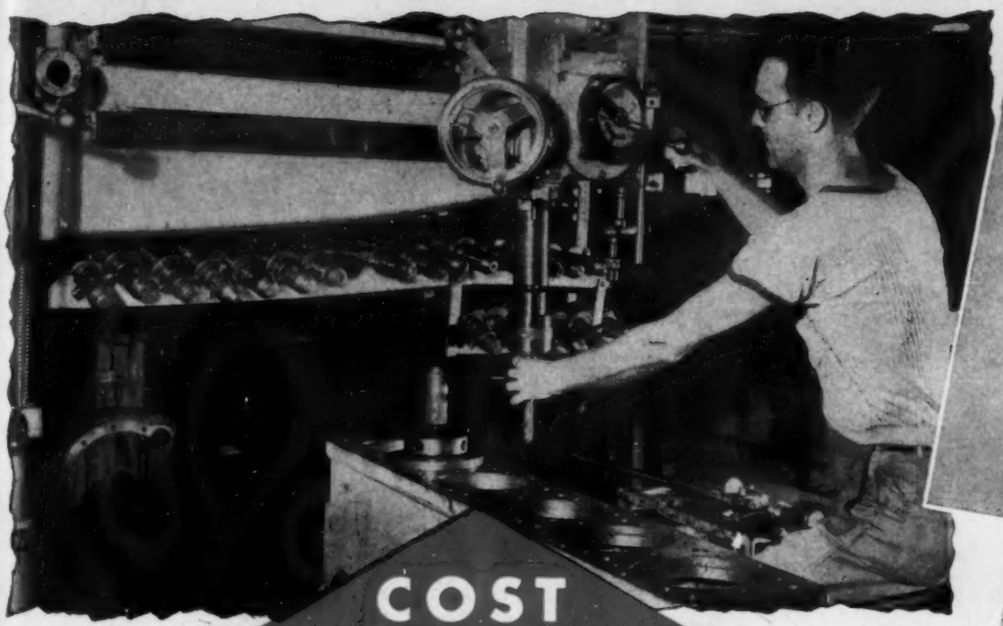
for Speed and Accuracy

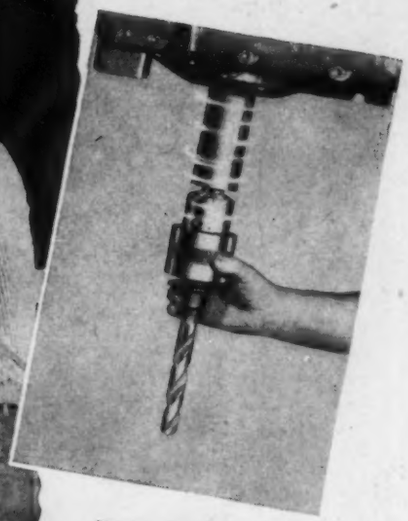
Baker Keyseaters do the job fast—and they do it *right!*

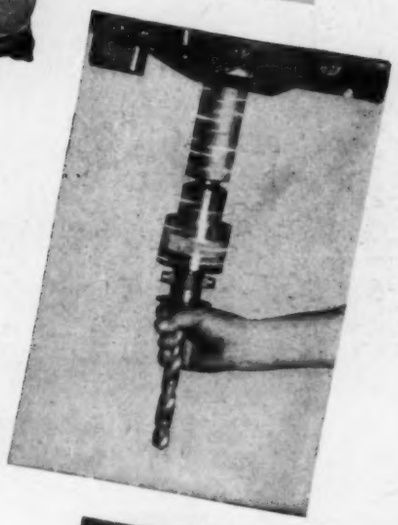
Accuracy is a *must* in this operation. One imperfect keyseat may mean fitting expense equal to the cost of cutting a great many keyways.

Baker Model 0 Keyseat is soundly designed . . . sturdily built for trouble-free, long life performance. Operated on the draw cut principle: equipped with a push-button controlled, non-reversing type, 2 HP, 1200 RPM motor, mounted on a pivoted base; crank action adjustable for setting stroke from 0 to 9". Capacity ample to cut keyways in mild steel up to 9" long by 1" wide at a feed of .005". Write for more details.

BAKER BROTHERS, Inc., Toledo, Ohio
DRILLING — TAPPING — KEYSEATING — CONTOUR GRINDING MACHINES







COST CUTTING TOOLS

McCROSKY

Wizard QUICK-CHANGE CHUCKS

...more pieces per hour at lower cost per piece

● There's no stopping—or even slowing down the spindle for tool changes when you use Wizard Quick-Change Chucks. To release the tool the operator simply grips the chuck lightly with his thumb and forefinger, and the collet drops out into his hand. The next tool and collet, are then pushed up into the revolving spindle and is automatically centered and locked rigidly in position—speeding up production and cutting costs. Try Wizards once and you'll never be without them. Furnished in four sizes. Bulletin No. 17-C gives full details. Send for a copy!

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

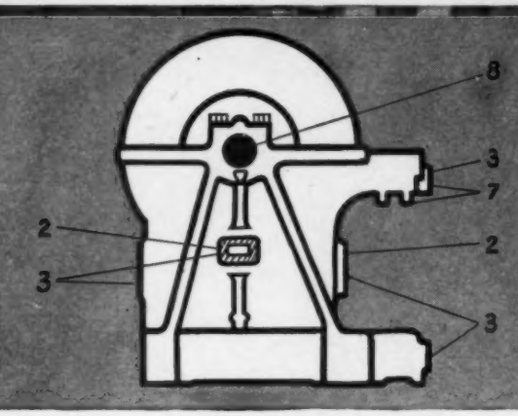
COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers
Block Type Boring Bars — *Turret* Tool Posts
Wizard Quick-Change Chucks — *Special* Multiple Operation Tools

The G. & L. Rotary Table permits machining on four sides of the casting with only one work setting.

Combined Machine and Rotary Table Movements Simplify Diverse Machining Operations and Reduce Work Handling



G. & L. Performs Boring, Drilling, Milling and Tapping in Easy Sequence on this Large Gear Housing—Indexing Part Speeds Production

This Giddings & Lewis horizontal boring machine has the flexibility and combination of movements necessary to complete all four sides of the casting without resetting. Boring, drilling, milling and tapping at various heights and in different positions are quickly and easily accomplished by table and saddle movement, indexing of the G. & L. rotary table and by raising and lowering the machine headstock.

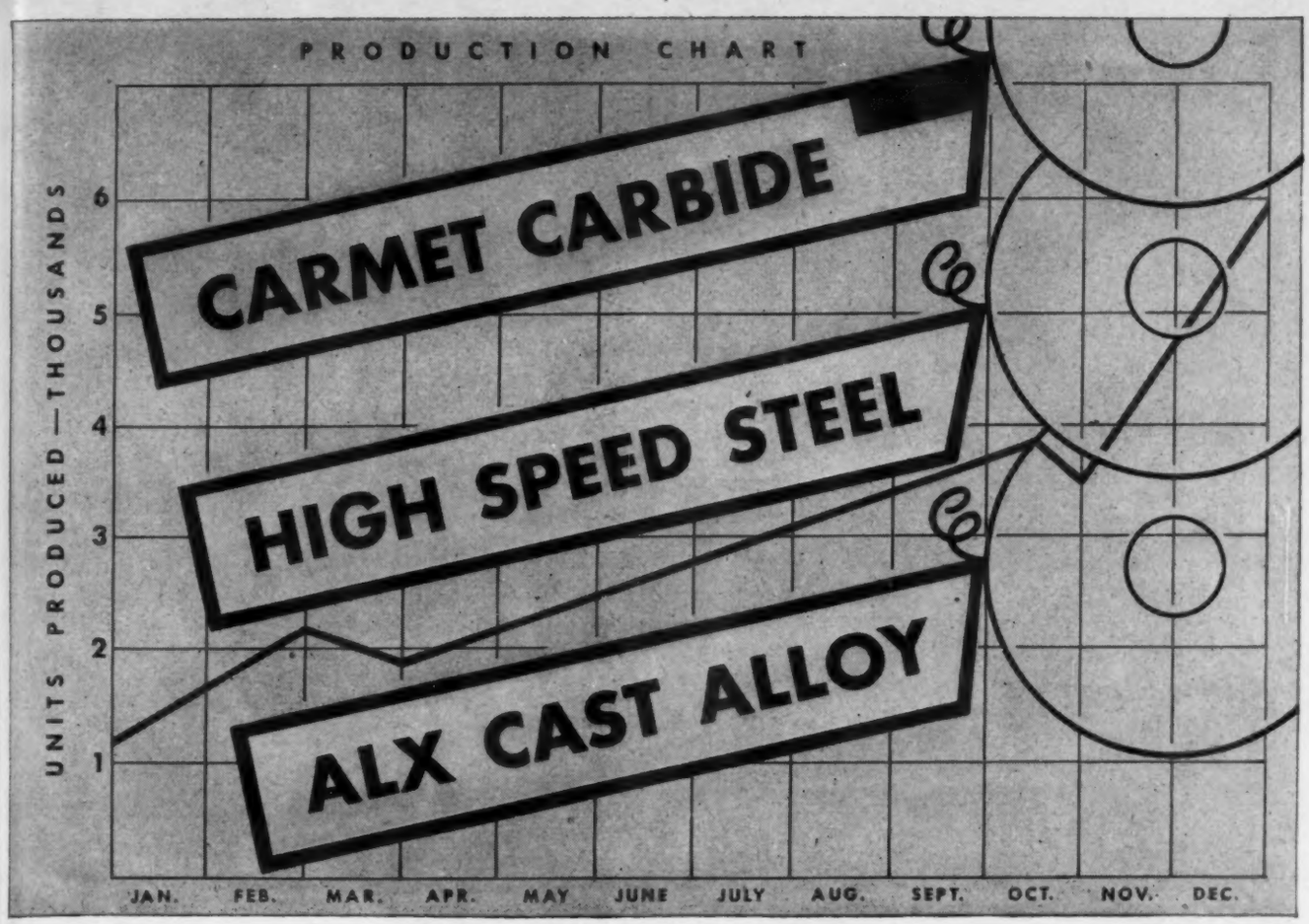
Regardless of how complex your machining problems may be, or the number of operations to be performed, you will find adequate capacity, flexibility and versatility in Giddings & Lewis machines to successfully complete your work. G. & L. engineers will be glad to work with you in solving your production problems.

Diversified Machining Performed on This G. & L.

1. Align casting frame from 9½" and 10½" worm gear holes. Index 90°.
2. Drill and tap 7 holes. Index 90°.
3. Face mill bore faces and bosses. Index 180°.
4. Face mill rear bore face.
5. Rough, semi-finish and finish bore worm gear bore.
6. Drill and tap 9 holes. Index 180°.
7. Miscellaneous drill, ream and tap 12 holes. Index 90°.
8. Bore: 18", 6.000", and 6.750" diameter holes.
9. Drill and tap 2 holes.

FREE: Write for Production Data Folder AM-47.

Giddings & Lewis MACHINE TOOL CO.
138 DOTY ST. • FOND DU LAC, WIS.



Which CUTTING TOOL MATERIAL WILL DO *Each* OF YOUR JOBS *Best*?

Allegheny Ludlum offers you—*from one source*—a choice of *every* type of cutting material . . . each in a wide and complete range of grades and sizes. That means a better opportunity for you to pick the tools *best* suited to each of your production jobs—with resultant savings in production time and costs. There's real value for you in one source for all your cutting tool requirements, plus a competent Mill Service Staff to assist your selection. • Write today—on your company letterhead, please—for our new, full-color booklet on "Cutting Tool Materials." You'll find it a big help in your production plans.

SEND FOR THIS NEW BOOK

ADDRESS DEPT. AM-63

ALLEGHENY LUDLUM

STEEL CORPORATION • Pittsburgh, Pa.

AL

Fine Tool Steels Since 1854

W&D 994

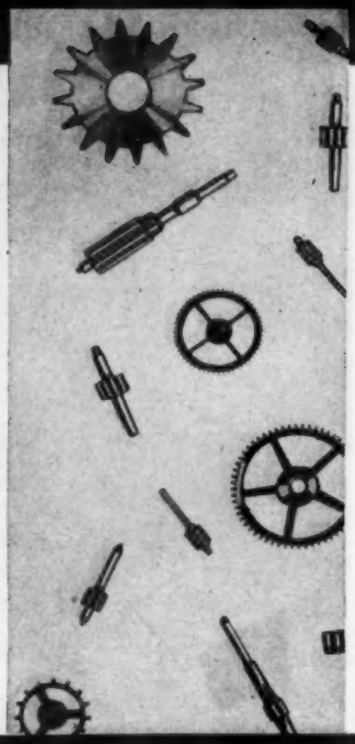
WALTHAM PINION & GEAR CUTTING MACHINES

Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyway with table tilted.

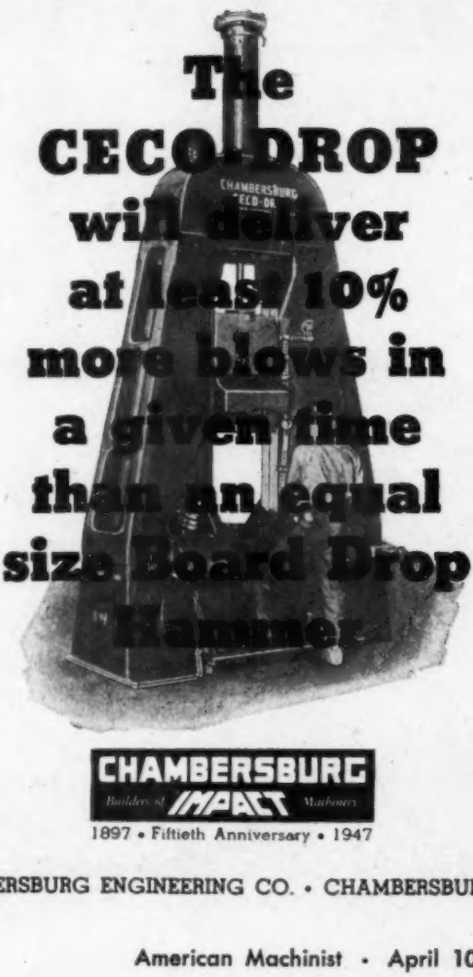
Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER 8, N. Y.

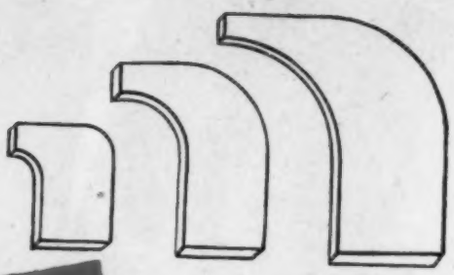
The CECO-DROP will deliver at least 10% more blows in a given time than an equal size Board Drop Hammer



CHAMBERSBURG
Builders of IMPACT Machinery
1897 • Fiftieth Anniversary • 1947

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PA.

Gage ground on complete contour



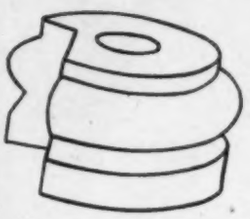
Various radius gages ground from same template

STUDER

PROFILE GRINDER

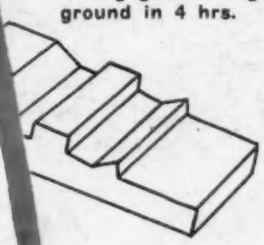
VERSATILITY!

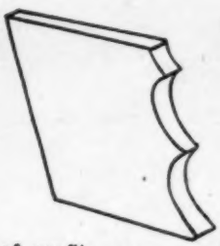
Grind straight or round form tools, sectional dies, gages of all kinds, templates, small dies and precision parts with the Studer Profile Grinder Type PSM. Profiles up to 6" in length, circular work up to 4" in diameter, parts up to 2" in thickness can be handled. A special template holder permits the grinding of circular contours such as cams over their entire circumference.



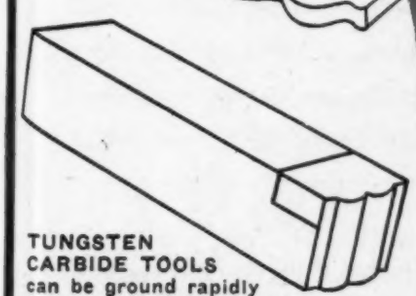
Circular form tool produced in 2½ hrs.

Profile gage 2.4" long ground in 4 hrs.





Set of profile gages produced in 3 hrs.



TUNGSTEN CARBIDE TOOLS can be ground rapidly and accurately with the Studer Profile Grinder. A special diamond wheel dressing device, equipped with a Carborundum cup wheel, assures accurate forming of bakelite and metal bonded wheels.

Form tool ground on complete contour.

SPEED!

One set up is all that is necessary for grinding any shape in one continuous operation, without removing work piece or template. Several flat pieces may be stacked up to 2" in height for simultaneous grinding. Small profiles can be accurately produced without preliminary grinding to form, and clearances on parts such as form tools can be ground without changing the original setting.

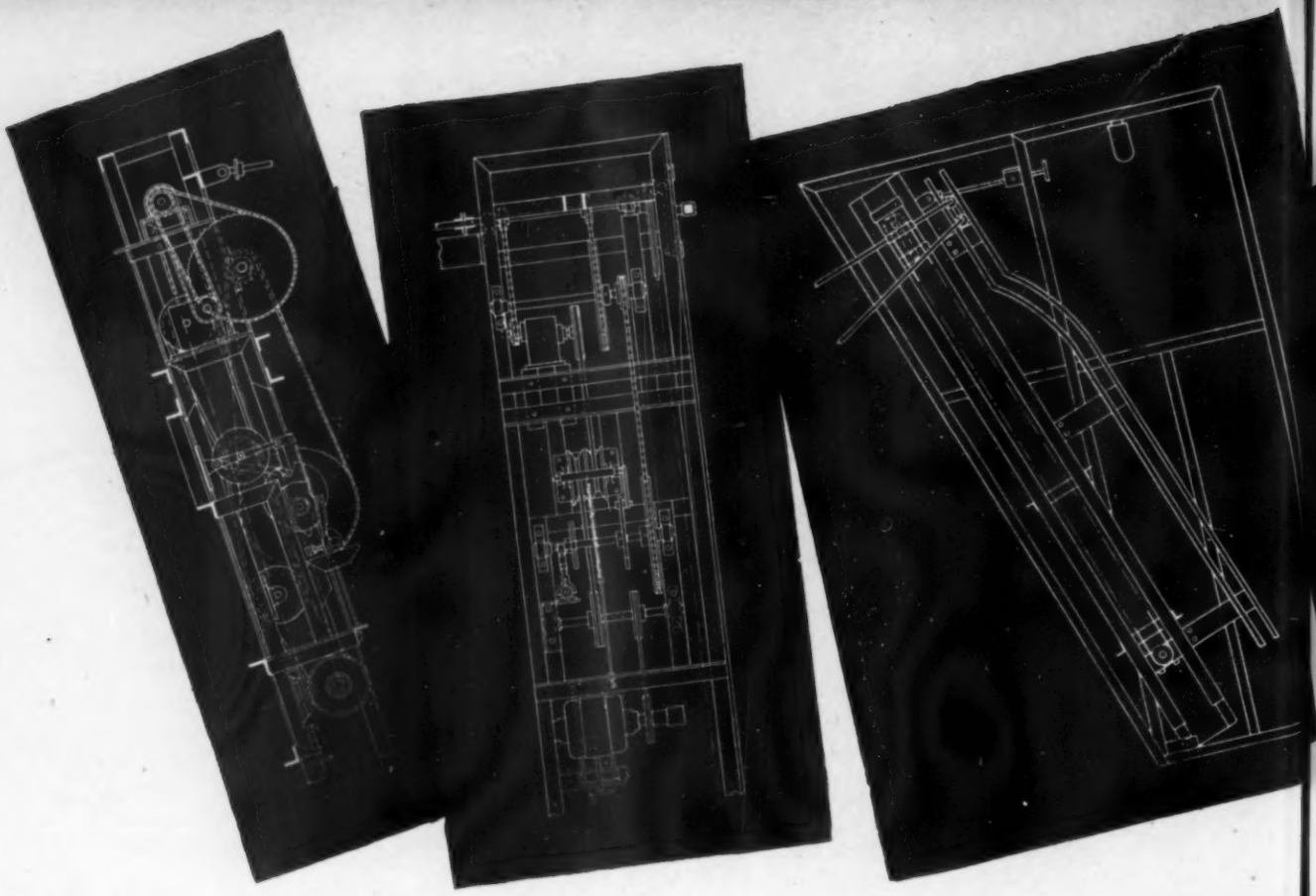
ACCURACY!

The Studer principle employs a tracer finger which follows the form of a template and transmits its movements to the grinding wheel through a pantograph. Because the wheel is shaped proportionately to the exact shape of the tracer finger, parts are ground complete in one operation—with one wheel. Fixed template eliminates errors due to incorrect manipulation. These features insure accuracy to within ±0.0002". Our engineers will give you expert assistance in specific applications.

COSA CORPORATION

COSA

CHRYSLER BUILDING
New York 17, New York



... This is how to spray-paint automobile fenders faster-better-cheaper

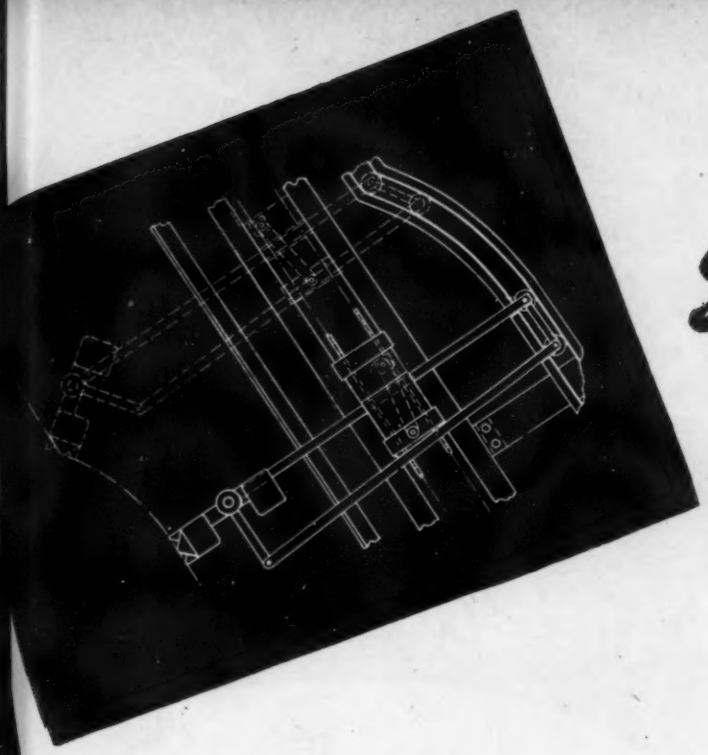
... And 28,000 Metalworking Executives Pay To Read

These Money Making Facts In American Machinist.

American Machinist readers don't read their favorite industrial magazine in leisurely detachment. They *study it* ... with intensity ... with the same hard searching for facts and better methods they apply to their jobs ... jobs which influence 90 per cent of Metalworking's production ... jobs that reach down deep into *all eleven divisions* of the metalworking industry. The money saving, work-producing facts and methods they find in *American Machinist*'s pages they put to work in their business. And because their business conservatively represents one third of all American industrial production, the amount of equipment they buy makes Metalworking the biggest industrial market for your products.

No matter what you make, if it can contribute to better production or better working conditions, Metalworking is a prime market ... and *American Machinist* your best marketplace.

GOOD advertising in Metalworking's No. 1 magazine



SIMPLE?

CLEAR?

Well — yes and no. To the non-technical eye, drawings like these are hopelessly complicated. But to the trained eyes of *American Machinist*'s readers, they are often the clearest, quickest, simplest way to drive home the features of new and better methods and products. They also save words . . . which saves the reader's time . . . which makes it possible for him to study and absorb all of the abundant information *American Machinist* brings him every other week (including your advertising). *American Machinist*'s editors build every issue on the solid premise that their job is to teach, inform, and help as clearly, concisely and interestingly as possible. And every issue uses every editorial tool to do the job that way: authoritative drawings, functional color, clear concise writing make this a balanced, logical, attractive magazine which has won two 1946 Industrial Marketing First Awards for editorial and appearance excellence. This basic editorial excellence is the reason 28,000 of Metalworking's top production executives pay to read *American Machinist*. It is the reason advertisers invest more money in *American Machinist* than in any other metalworking magazine. And it is also the reason why good advertising in *American Machinist* sells more goods at less cost. Ask your nearest *American Machinist* representative to tell you more about this quality marketplace for your products.

This advertisement, one of a series appearing in the advertising press, we think is of interest to you as well as to the advertising executives to whom it is primarily addressed. As it points out, *American Machinist* is a quality advertising medium because its editorial quality draws readership by metalworking executives like you. It also emphasizes the use our editors make of drawings and photographs to bring you information as clearly, simply, and rapidly as possible.

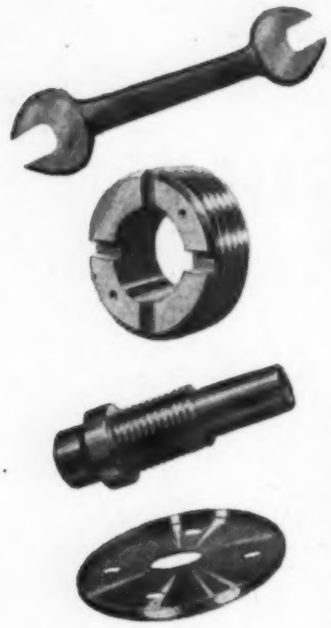
sells more goods at less cost

American Machinist

Now is the time to take advantage of OAKITE'S

COST-CUTTING materials and methods for Cleaning and Surface Conditioning

FORGINGS...DIE CASTINGS...MACHINED PARTS...STAMPINGS



WHATEVER your product .. whether the metal is steel, cast iron, aluminum, brass, copper, bronze, zinc, magnesium .. the intermediate and final cleaning and surface conditioning operations before final finishes are applied, must be performed with exacting thoroughness and come within specified cost limits.

Final Finish Depends on Thorough Preliminary Cleaning

Here is where cost-cutting Oakite cleaning and surface-conditioning materials, each one designed for use on certain metals, and the successful experience gained in applying them to forgings, die castings, machined parts and stampings, can be helpful to you. Used in tank or automatic washing machine, these high quality Oakite materials give you the chemically or physically clean surfaces so essential to the finish you want.

No Substitute for Experience

There is no substitute for successful experience and "know-how." It is why so many thousands of leading concerns in the metal working industries continue to rely on Oakite materials and the technical personalized service back of them. We should like to serve you in the same practical way.

Your Production Cleaning Problem Invited

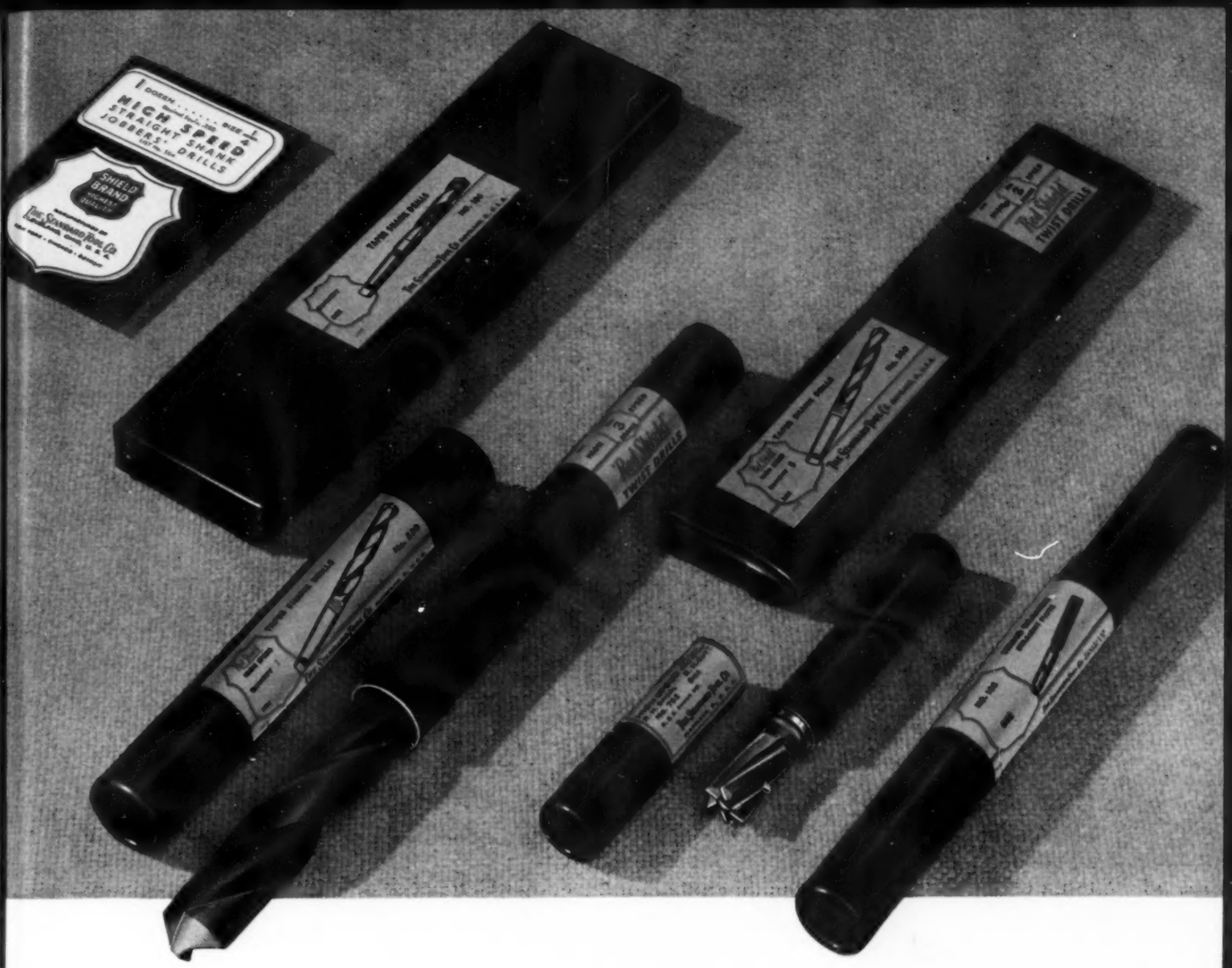
If you have a production cleaning operation that you feel could be speeded up, improved, or its cost lowered, our Technical Representative in your locality will be glad to stop in and discuss it with you. There is no obligation. Your letterhead inquiries invited and promptly answered.

Oakite Products, Inc., 24 Thames Street, New York 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialized* **CLEANING**

MATERIALS · METHODS · SERVICE



IMPROVED PACKAGING

an added Shield Brand Value

THE quality and utility of Shield Brand Tools is protected from factory to user by improved packaging.

As an added convenience, all Shield Brand Tools of High Speed Steel are packaged in Green Containers with Orange Labels. Those of carbon steel in Blue Containers with Yellow Labels. Thus you can quickly identify and select from stock by the color of its package, the type of tool desired.

Standard Shield Brand Packages, the use determined by the requirements of each tool are—individual tubes of strong tough cardboard; metal edge cardboard boxes, strongest type known; heavy craft paper, and tough manilla paper envelopes.

Thus modern improved packaging adds both value and convenience to Standard Shield Brand Drills, Reamers, Taps, Dies and Milling Cutters. Mill Supply Distributors from coast to coast supply these fine tools.

STANDARD TOOL CO.

THE STANDARD TOOL CO.

CLEVELAND

Warehouses: New York • Detroit • Chicago

for COMPLETE service on metal cutting tools

specify

SHIELD BRAND

THE Standard Shield Brand Line of metal cutting tools is complete.

Shield Brand Drills, Reamers, Taps, Dies, Milling Cutters and Special Tools—all made by one responsible maker—to the highest standard of quality and performance—are available at Leading Mill Supply Distributors from coast to coast.

By Standardizing on Shield Brand Tools, time and money can be saved in your purchasing department, stockroom and tool crib, through simplification in ordering stock, in record keeping, and tool maintenance.

Mechanics like the uniform operating characteristics of Standard Shield Brand Tools which save time and result in increased production per man and per machine.

THE STANDARD TOOL CO.

CLEVELAND

Warehouses: New York · Detroit · Chicago

Factory-wired, conveniently packaged Reliance V★S Drive provides unlimited range of adjustable speeds for Diesel locomotive axle grinder . . . from A-c. circuits.

Whatever *your* product, whatever the machines used in making it, Reliance V★S Drive can increase the speed of production — and reduce your costs at the same time. V★S, the *All-electric, Adjustable-speed Drive operating from A-c. Circuits,* has done just this in many thousands of diversified applications.

Using A-c. power, the V★S Drive offers you unlimited flexibility of operation through automatic or manual control, either at the machine or from remote stations. Specifically, this means quick, smooth starts and stops, stepless speed changes, maintenance of proper tension and reversal at any desired point. Available in sizes from 1 to 200 horsepower. For more details of V★S operation, return coupon below today!

RELIANCE V★S DRIVE

RELIANCE ELECTRIC & ENGINEERING CO.
1075 Ivanhoe Road • Cleveland 10, Ohio

Appleton, Wis. • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Denver Detroit • Gary • Grand Rapids • Greenville, S. C. • Houston • Kansas City Knoxville • Los Angeles • Milwaukee • Minneapolis • New Orleans • New York Philadelphia • Pittsburgh • Portland, Ore. • Roanoke, Va. • Rockford • St. Louis San Francisco • Seattle • Syracuse • Tampa • Tulsa • Washington, D. C. Sao Paulo, Brazil

MAIL THIS COUPON TODAY!

RELIANCE A-C D-C MOTORS

"Motor-Drive is More Than Power"

RELIANCE ELECTRIC & ENGINEERING CO.
1075 Ivanhoe Road, Cleveland 10, Ohio

Please send your Bulletin 311 describing the operation and advantages of the Reliance V★S Drive.

NAME_____

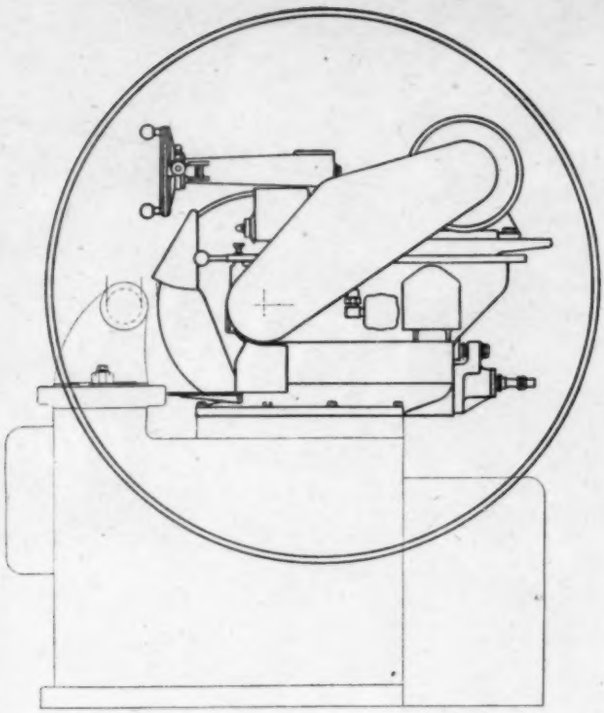
COMPANY_____

TITLE_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

You too can have FITCHBURG *Automatic* PRECISION GRINDING *INEXPENSIVELY*...



FITCHBURG Bowgage Head mounted on another make of grinding machine

by installing FITCHBURG Bowgage Heads on the Grinders you now have.

Just as we did in the above case—and in many others—we'll be glad *to prove to your satisfaction* the ease, the simplicity, and the *inexpensiveness* of installing Fitchburg Bowgage Heads on your present grinders. With your grinding equipment thus modernized, the resulting mass production applied to your precision grinding will soon pay off the small cost involved.

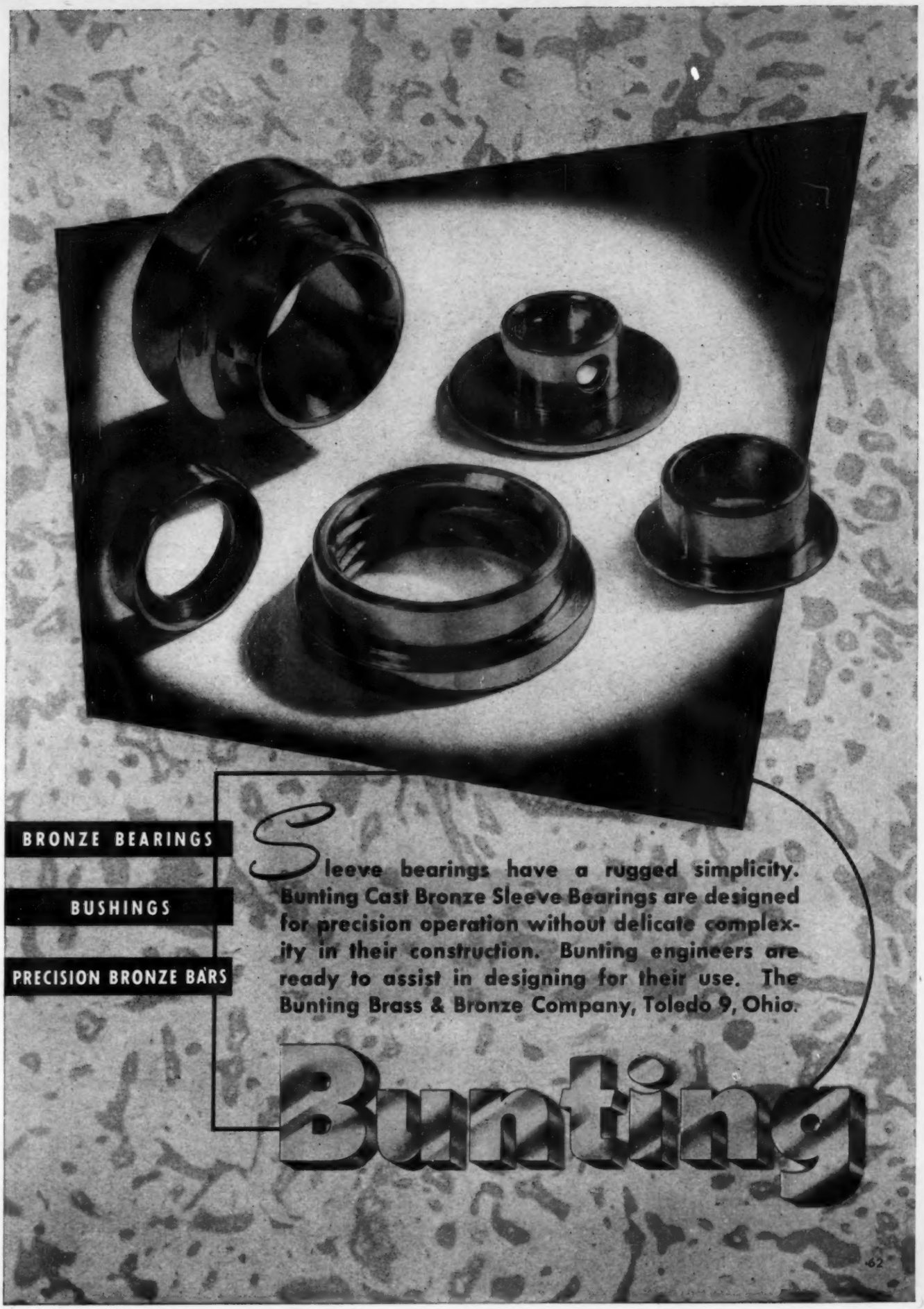
The FITCHBURG Bowgage Head is a self-contained grinding unit, with *all* its movements and controls within itself. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position—all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed—thus protecting your investment in grinding machinery. Fitchburg engineers will welcome the opportunity to help you solve your grinding modernization problem. There is, of course, no charge for this service. Send us the details—blueprints if available—and see how easily and inexpensively *you too* can have FITCHBURG AUTOMATIC PRECISION GRINDING in your shop.

FITCHBURG BOWGAGE HEAD

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders


BRONZE BEARINGS
BUSHINGS
PRECISION BRONZE BARS
Sleeve bearings have a rugged simplicity. Bunting Cast Bronze Sleeve Bearings are designed for precision operation without delicate complexity in their construction. Bunting engineers are ready to assist in designing for their use. The Bunting Brass & Bronze Company, Toledo 9, Ohio.
Bunting
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WHERE *Precision* COUNTS

• • • the METRO LINE of Precision Gages, Carbide Tipped Tools and heavy-duty, shell-type Expanding Reamers with Full-Length Carbide Blades have proven in countless tests their ability to do a job the way it should be done. Soundly engineered by men who *know* tools . . . who study them under actual working conditions, Metro standard and special Tools and Gages measure up in constant performance to your most exacting production requirements. Write today for information. Learn how METRO can help you on your tough assignments. No obligation.

METRO

TOOL AND GAGE COMPANY
4240 Peterson Avenue
Chicago 30, Illinois

Baush... both flange drilling and rectangular hole layouts. Available in 3 sizes, shown in specifications, with adjustable arms to handle drilling of hole centers that constantly vary—or with master-bored cluster plate having spindles in fixed pattern to fit one operation. Horsepower capacities are graduated to cover predominant drilling operations.

Spindle heads are of adjustable, joint driven type, with slip sleeve spindles that can be furnished in various standard sizes to meet work requirements. "W" Type machines are arranged for 18" maximum stroke of heads—adjustable feed rates—2 speed geared yokes and can be adapted for tapping. Either adjustable knee tables or box table can be supplied.

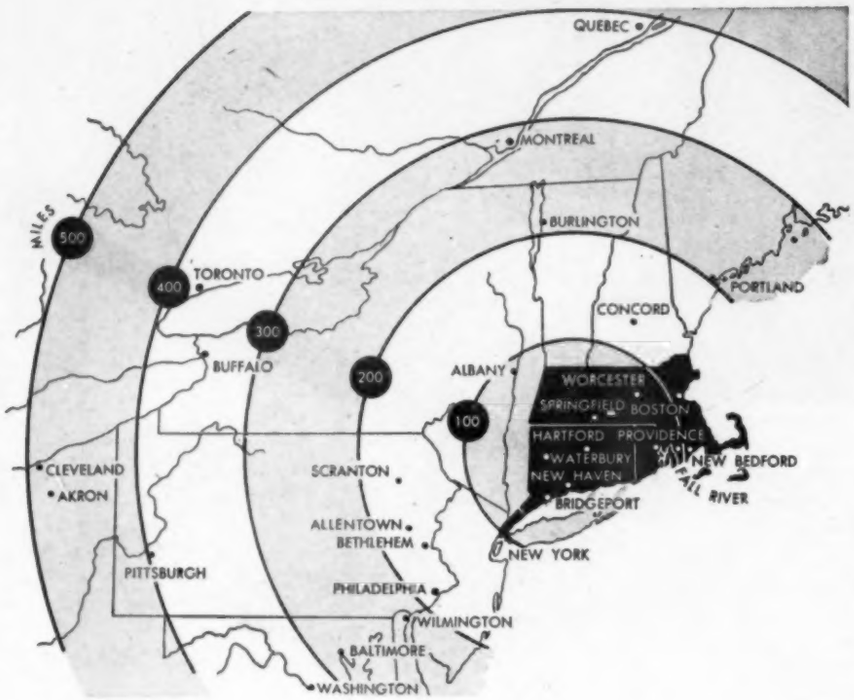
Also available in single way, 2-way or 3-way machines.

SPECIFICATIONS OF STANDARD W-TYPE MACHINES

	W-6	W-7	W-8
Maximum Horsepower Capacity for Spindle Drive	10 H.P.	20 H.P.	30 H.P.
Top of Base to Bottom of Head Flange, Head up	60"	54"	50"
Max. Standard Stroke of Head	18"	18"	18"
Overall Height of Machine with low base	139"	141"	150"
Approx. Net Weight of Machine (Lbs.)	15,000	20,000	27,000
Head Sizes Available — Measurements taken between Spindle centers as follows: At Side, S. At Front, F.	18"S. x 24"F. 18"S. x 36"F. 24" round	20"S. x 30"F. 20"S. x 45"F. 32" round 36" round	20"S. x 30"F. 20"S. x 52"F. 32" round

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Aiming for More Customers?



41.2% of all U. S. retail sales are made within 500 miles from the center of Southern New England!

NO MATTER where you locate on the New Haven, you'll be near a major portion of America's buying power.

38.1% of the nation's population lives within 500 miles from the center of Southern New England. This area earns 54.2% of America's industrial wages and salaries; pays 50% of individual U. S. income taxes; holds 72.4% of the country's savings deposits; bought 41.2% of all goods sold across retail counters in 1945.

Being close to this tremendous purchasing power is just one of many advantages enjoyed by industry in Southern New England.

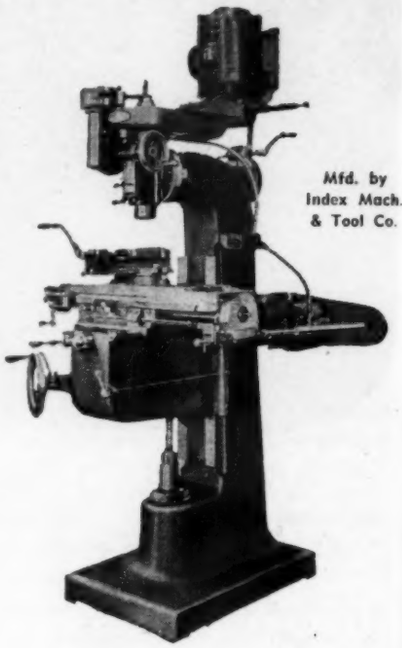
For more facts to help you plan for future profits, write for a free copy of "SOUTHERN NEW ENGLAND FOR TOMORROW'S INDUSTRY." Address: P. E. Benjamin, Mgr., Industrial Development, New Haven Railroad, Room 201, 80 Federal St., Boston 10, Mass.

THE NEW HAVEN R. R.

SERVING NEW YORK AND THE GREAT INDUSTRIAL STATES OF MASSACHUSETTS, RHODE ISLAND AND CONNECTICUT

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

WELDING SPEEDS FABRICATION

AIR TOOLS SPEED WELDING

CHIPPING

GRINDING

SCALING

Modern practices for producing good sound welds put equal emphasis on the preparation for welding—the welding—and the finishing of the weld. High-quality welds require careful performance of all three phases.

Ingersoll-Rand Air Tools have contributed to the advances in welding, especially by improving the preparation and finishing operations.

Improve and speed up your welding and satisfy your welders with I-R CHIPPING HAMMERS for peening, beveling, root chipping, cleaning off excess metal . . . GRINDERS for cleaning, smoothing, polishing, wire brushing . . . SCALERS for cleaning, removing excess metal and spatter . . . DRILLS for studding . . . AIR HOISTS for handling heavy weldments.

In most instances our branch offices can fill your order from their stocks—call them on the phone and start using I-R Air Tools today.

COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

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MACHINE COMPANY

NEW BRITAIN - CONN.

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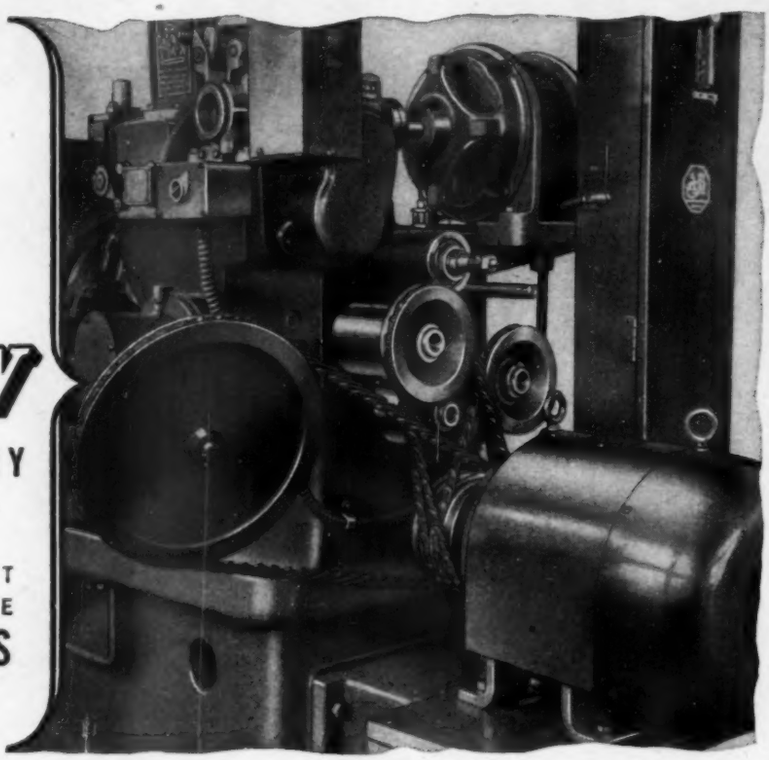
THE WORLD'S FINEST
MULTIPLE SPINDLE
CHUCKING MACHINES



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is
easy on the
operator
• • hammermen prefer
the safer, easier-operated
CECO-DROP

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Builders of IMPACT Machinery
1897 • Fiftieth Anniversary • 1947

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PA.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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913 Tilden St.
Saginaw, Michigan

Giant KEYSEATERS

Sensitive
DRILLING MACHINES
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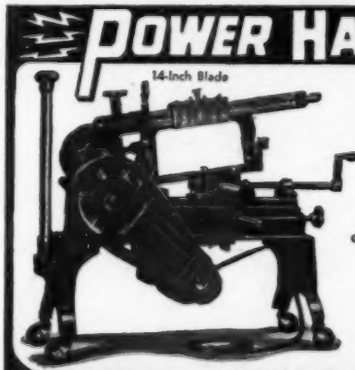
CINCINNATI OHIO

POWER HACK SAW ★



LOW PRICED
SELF-CONTAINED
PORTABLE
STURDY
READY TO WORK
ECONOMICAL

Angle Cutting Vise

EXPORT DEPT.
1111 SO. FERRY BLD'G.
NEW YORK 4, N.Y.

WRITE FOR BULLETIN NO. 400

MILLER-KNUTH MFG. CO. OMAHA, NEB.

SPECIAL DRAWING COMPOUND GREATLY IMPROVES PRODUCTION ON STAINLESS STEEL!

Ten steps in the production of stainless steel teat cups for milking machines. A few other applications where Standard's special stainless steel drawing compound has aided production include milk pails, stainless steel sinks, meat trays and cream separator discs and bowls.

Good finish, long die life, and a minimum of rejected parts are some of the benefits which resulted when the right drawing compound was found for producing the stainless steel parts pictured above.

When this job was first started, a heavy base oil—often used successfully in drawing—was tried. But this wasn't an ordinary job. Parts were frequently torn or severely scratched—a waste of time and steel. Die life was short because of loading or metal pick-up. Then a Standard Oil Lubrication Engineer went to work with the plant men. He had met stainless steel problems before. A special drawing compound was developed. With this compound, rejected parts were practically nil, die life was greatly improved, and only a simple polishing operation was needed to produce the desired finish on the completed part.

This special compound has since been used successfully on numerous other stainless steel drawing jobs. Perhaps we can help you cut costs and make better products. A Standard Oil Lubrication Engineer can advise you.

There are two sound reasons why Standard Oil Lubrication Engineers are able to solve many plant problems. First, they have complete knowledge of the lubricants developed by Standard Oil for practically all operations. Second, they have wide experience in applying these products in other plants.

You can reach one of these Engineers at the nearest Standard Oil Company (Indiana) office or by writing 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

NEW STANOLITH Lithium-soap greases

...one grease does more jobs

HERE IS a new type of grease that offers interesting possibilities for improving lubrication on many applications in your plant.

Stanolith Greases are an outgrowth of the lithium-soap greases developed during the war to meet severe conditions in the lubrication of ordnance and aviation equipment. They are outstanding not only because of their many unusual performance characteristics but because these characteristics are combined in two grades.

Stanolith Greases provide two unusual benefits:

1. They reduce the number of grades and brands of grease needed.
2. They minimize the danger of applying the wrong grease.

Other advantages you can secure from Stanolith Greases may be suggested by the qualities listed at right. A Standard Oil Lubrication Engineer will be glad to discuss applications in your plant where Stanolith Greases will reduce maintenance or improve operation.

Call the nearest local Standard Oil office or write 910 South Michigan Ave., Chicago 80, Ill., for the Engineer nearest you.

Performance Characteristics of Stanolith Greases

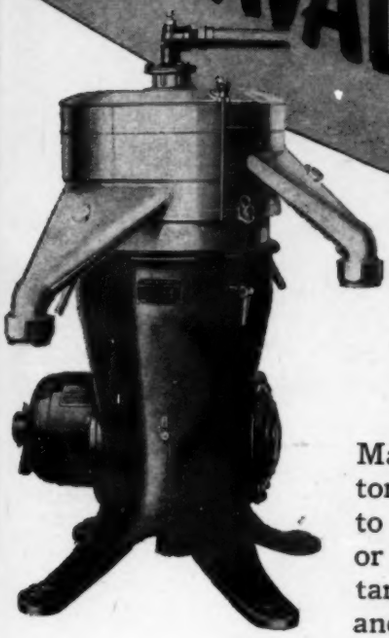
- operate over a wide range of temperatures—have high dropping point.
- have extreme water resistance.
- have unusual mechanical stability—a minimum of oil evaporation and separation.
- are fortified for chemical stability, contain effective inhibitors.
- are corrosion resistant.

Two grades of Stanolith Greases are available: No. 42—with a No. 1 consistency, and No. 57—with a No. 2 consistency.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

To clean these Oils: use a DE LAVAL PURIFIER

- BALER OIL
- BORING OIL
- BRIQUETTING OIL
- CABLE OIL
- CUTTING OIL
- DRAWING OIL
- ENGINE OIL
- GRINDING COOLANT
- HONING OIL
- HYDRAULIC OIL
- LUBRICATING OIL
- MOTOR BLOCK TEST OIL
- QUENCHING OIL
- RECOIL OIL
- SHOCK ABSORBER OIL
- SLUSHING OIL
- TRANSMISSION OIL
- WASHING OIL



Many kinds of factory oils are subject to spoilage by one or both of two contaminants: ***water*** and ***dirt***. Slushing compounds and hydraulic oils, for example, are ruined if even a little condensate is allowed to remain in them. Cutting oil, motor block test oil, shock absorber oil and others are spoiled if dirt is not promptly removed.

De Laval Oil Purifiers remove ***both*** dirt and water by centrifugal force. They restore oils to their original clarity and cleanliness, and make them safe to be used over and over again. They operate at constant efficiency, without periodic replacements of essential parts. Cleaning and normal care are all that is required to keep them operating at top capacity.

Large or small, almost every shop can profitably use a De Laval Oil Purifier. For some a stationary machine is called for, for some a portable, and for others having more extensive operations, a specially designed De Laval system can be most profitably used.

- Ask for Bulletin FF.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
PETERBOROUGH
QUEBEC MONTREAL WINNIPEG VANCOUVER

Save more than the Oil with

PURIFIERS and CLARIFIERS FOR FACTORY OILS

DE LAVAL

for Continuous

PRODUCTION

HIGH DUTY

Kaufman No. 10A special Hi-Duty Tapping machine with two spindle head and eight station fixture. Same machine with fixture changes can be used for similar second operation work.

Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positively wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . control to protect tap overload, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable.

COMPLETE INFORMATION UPON REQUEST

KAUFMAN MFG. CO.
MANITOWOC, WISCONSIN

ECONOMY

THE W&B CO.

LUBRICANTS

There is an Economy Lubricant **especially adapted** for your particular operations—

ECONOMY LUBRICANT 1888—
new liquid type, water soluble lubricant for grinding and cutting—highly detergent, gives faster, keener, cleaner grinding.

ECONOMY GRINDING LUBRICANT E-1—
original paste-form water soluble grinding lubricant for the highest reflective finishes.

ECONOMY BASES (Sulphurized Fats)—
to make oils for grinding and cutting.

ECONOMY GRINDING OILS—
for all types of oil grinding operations.

Bring your grinding and cutting lubrication problems to us for the dependable advice of our experienced technicians.

THE WHITE & BAGLEY COMPANY
WORCESTER 8, MASS., U.S.A.
Original Producers of Grinding Lubricant

Spare a moment?

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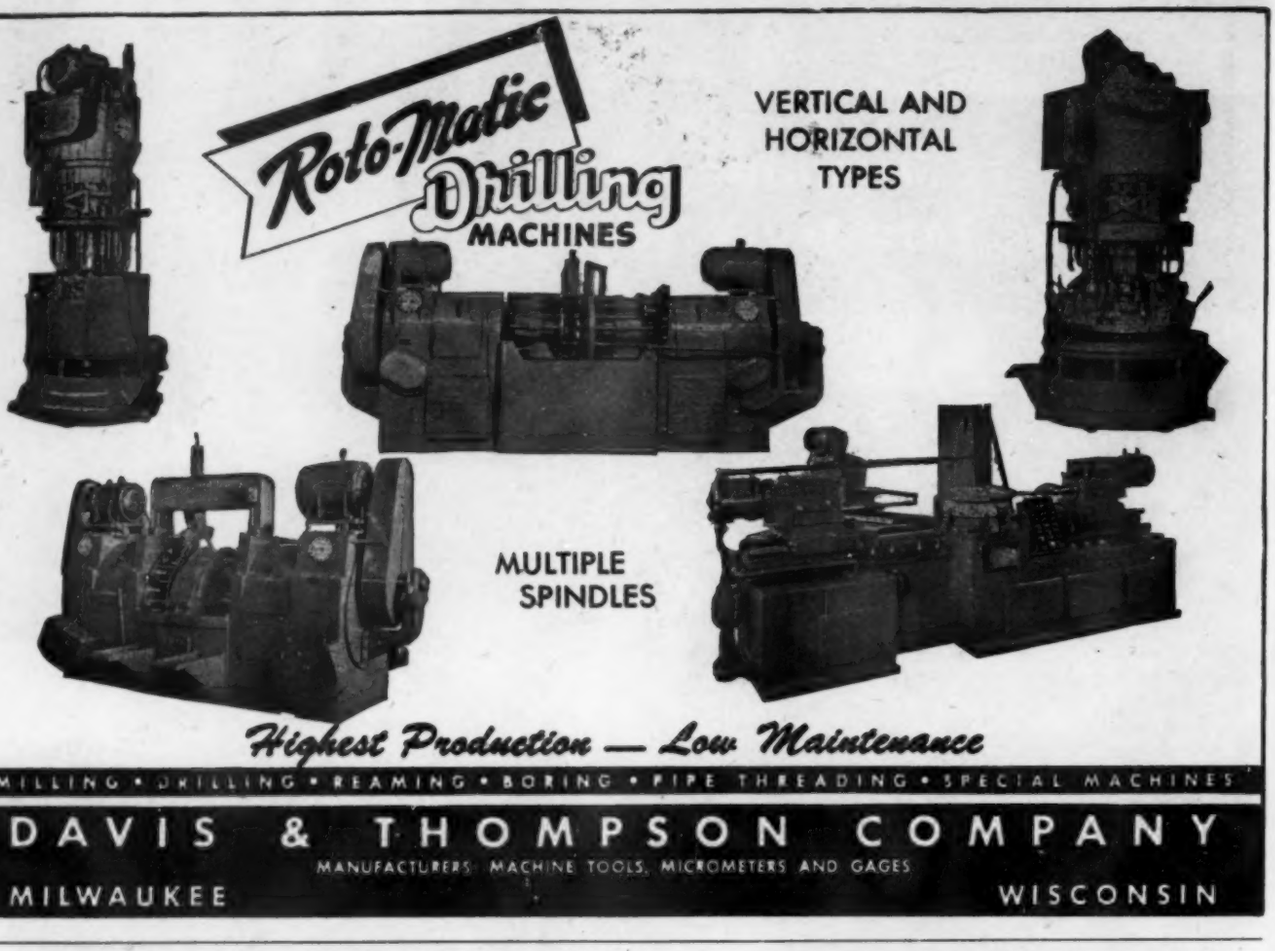
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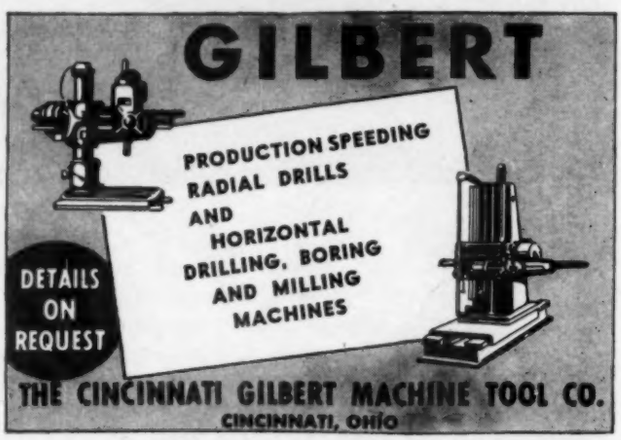
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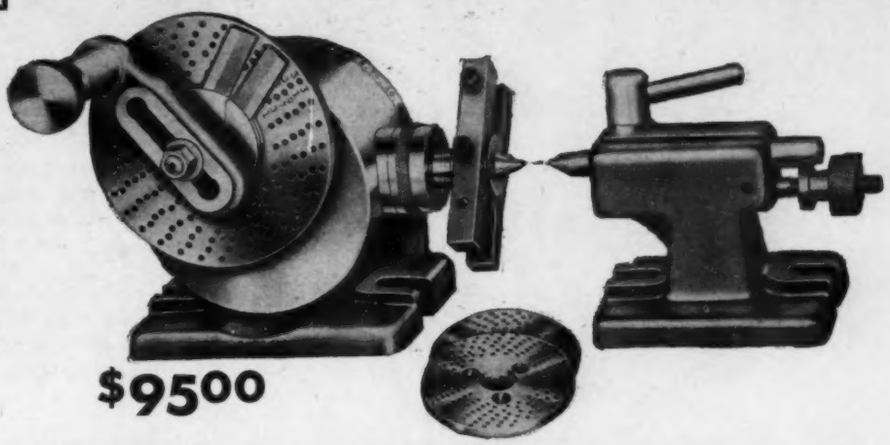

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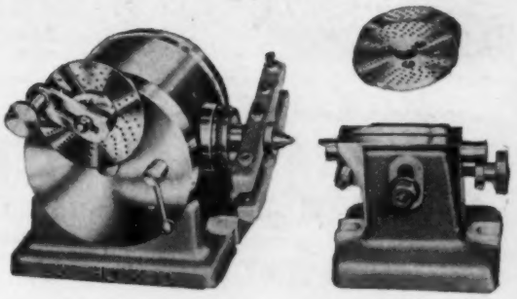

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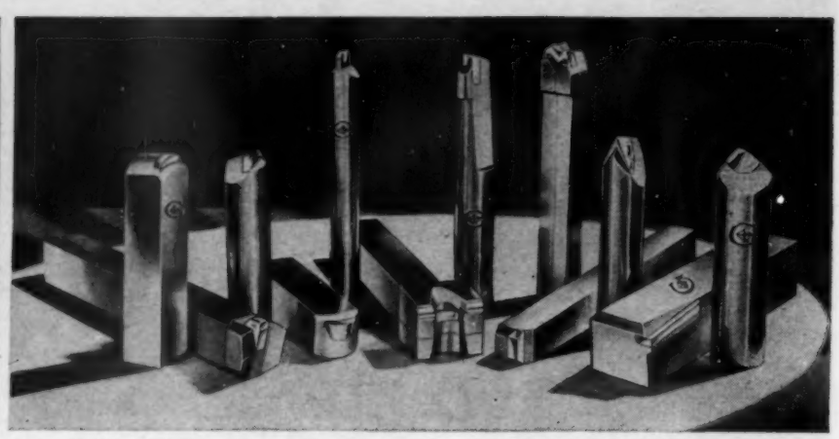

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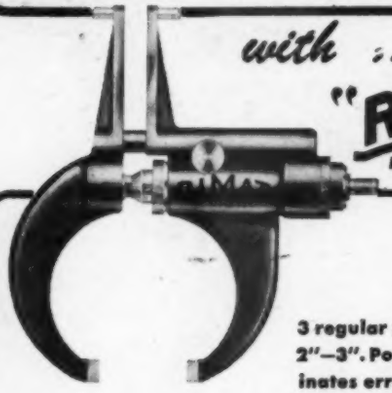

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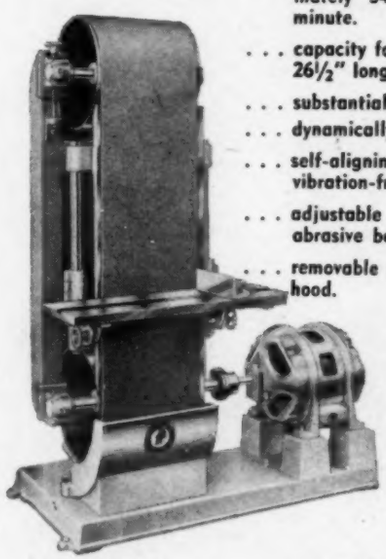

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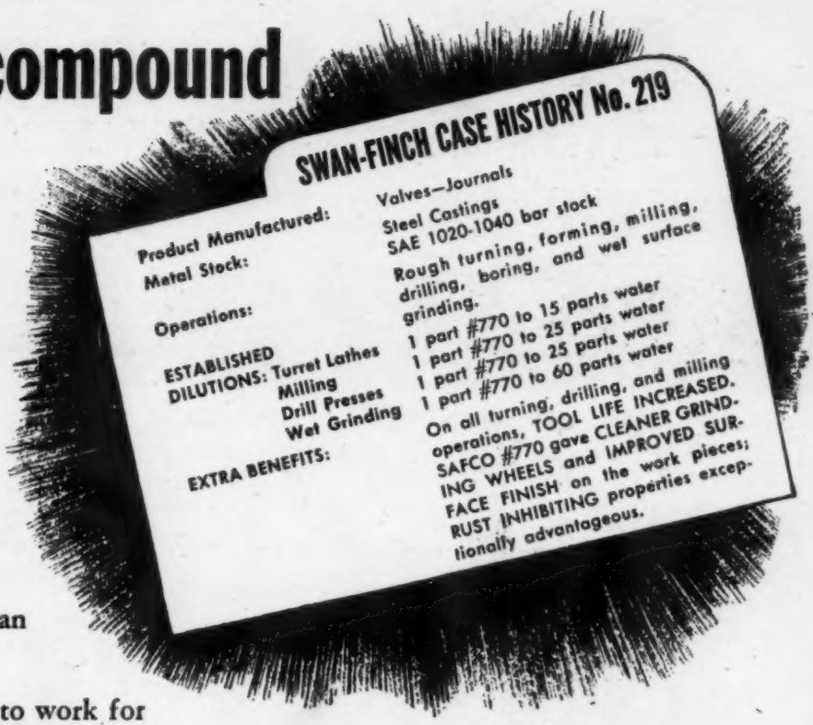
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Product Manufactured: Valves—Journals
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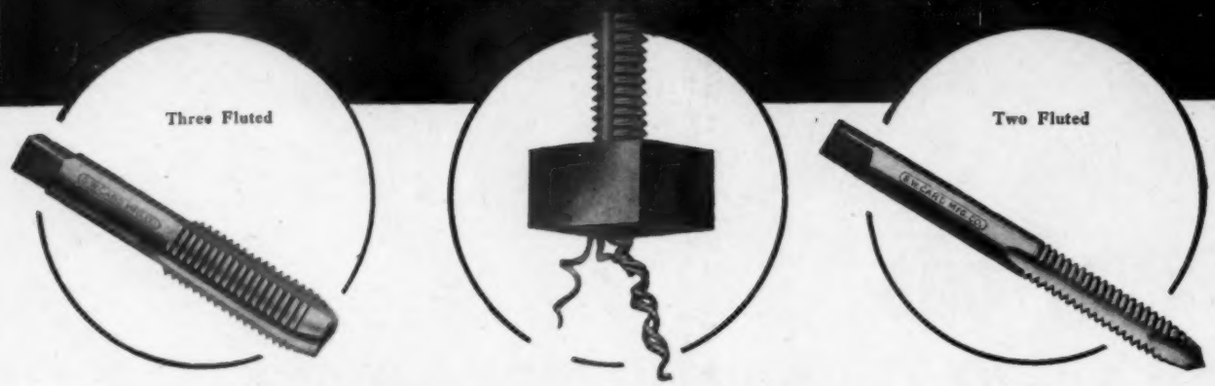
for free, accurate thread cutting in deep holes



Designed for tapping deep through holes or blind holes drilled deeply enough for chip clearance at bottom of hole. Cutting is done by the first few threads milled at an angle. Chips are forced ahead of tap, preventing chips clogging in flutes, thereby increasing strength of tap and minimizing chances of breakage.

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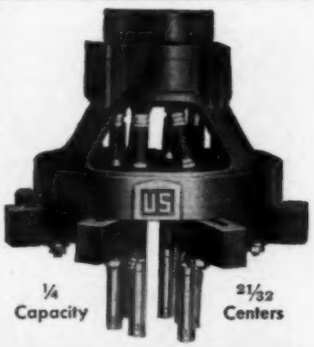

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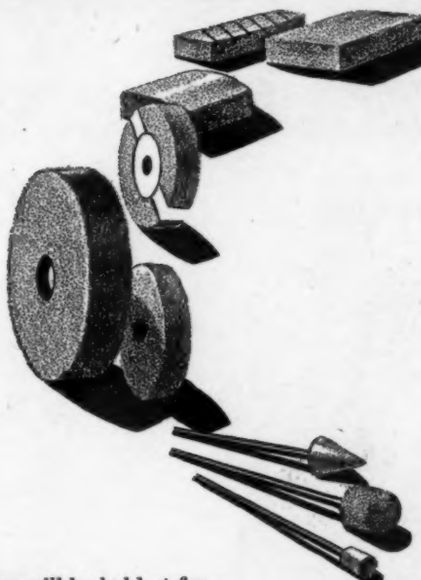

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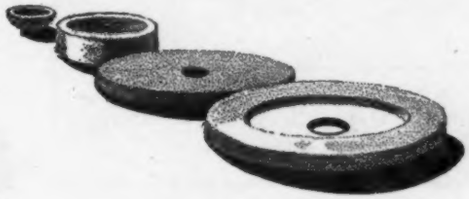

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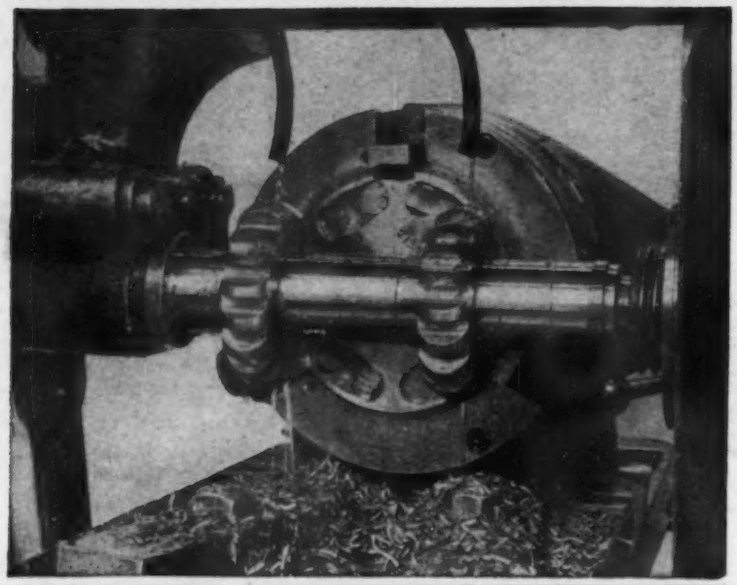

. . . with the HARTFORD SUPER-SPACER

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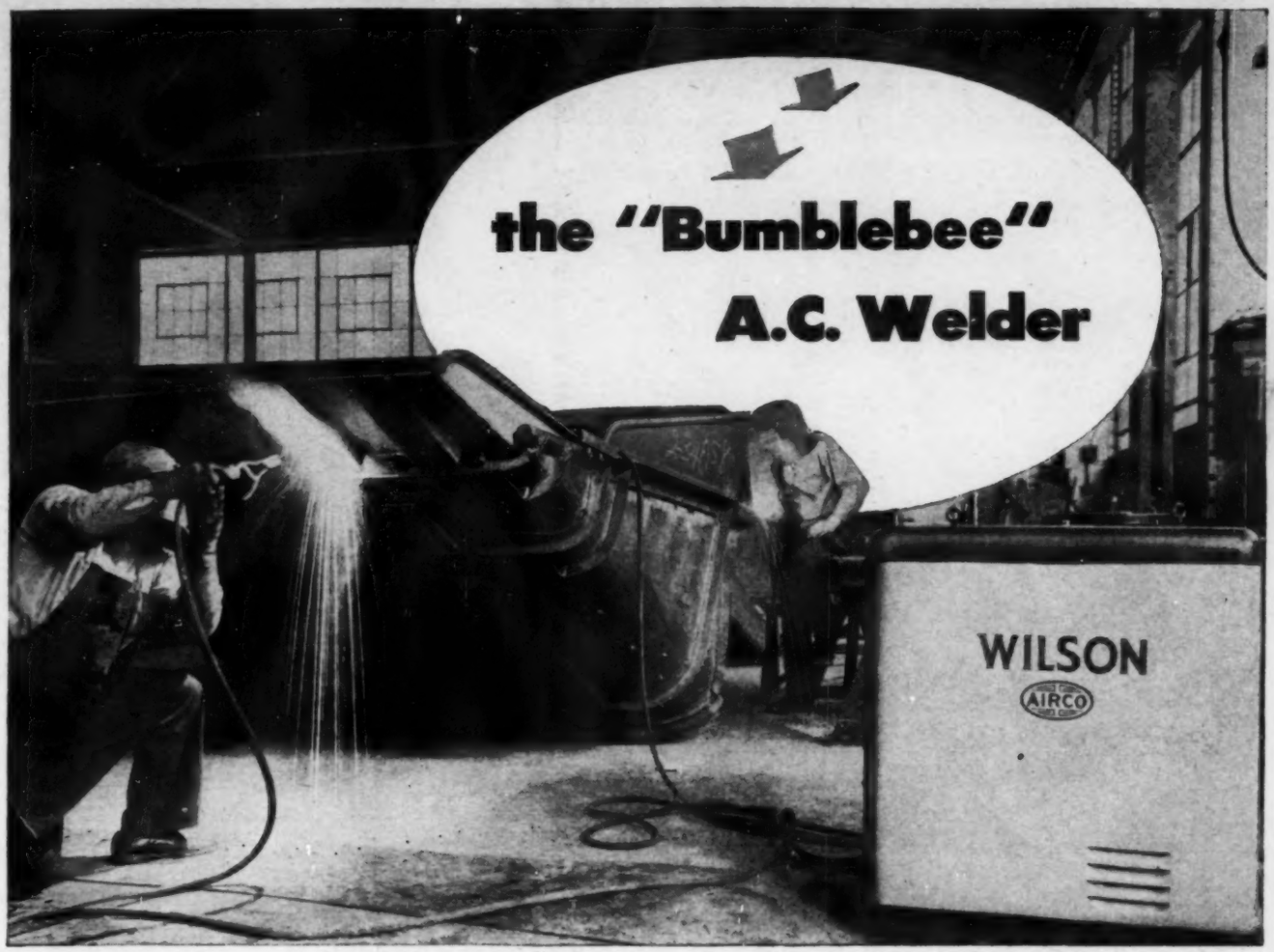

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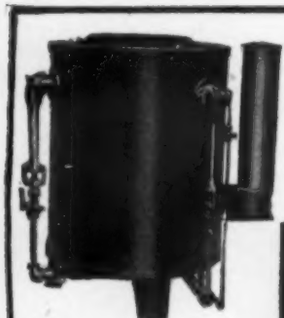

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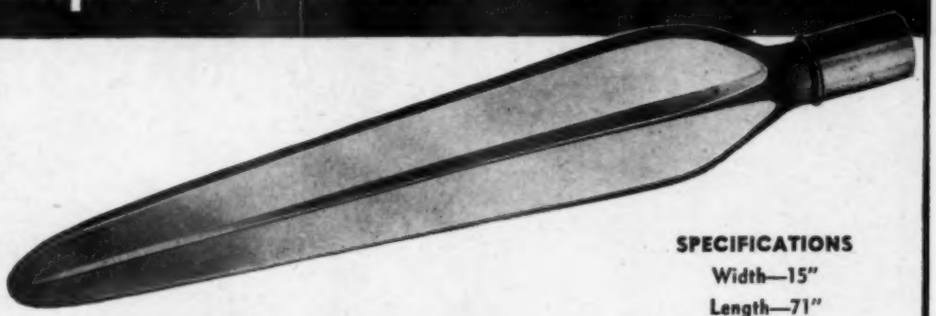
Another Example of WALKER LEADERSHIP

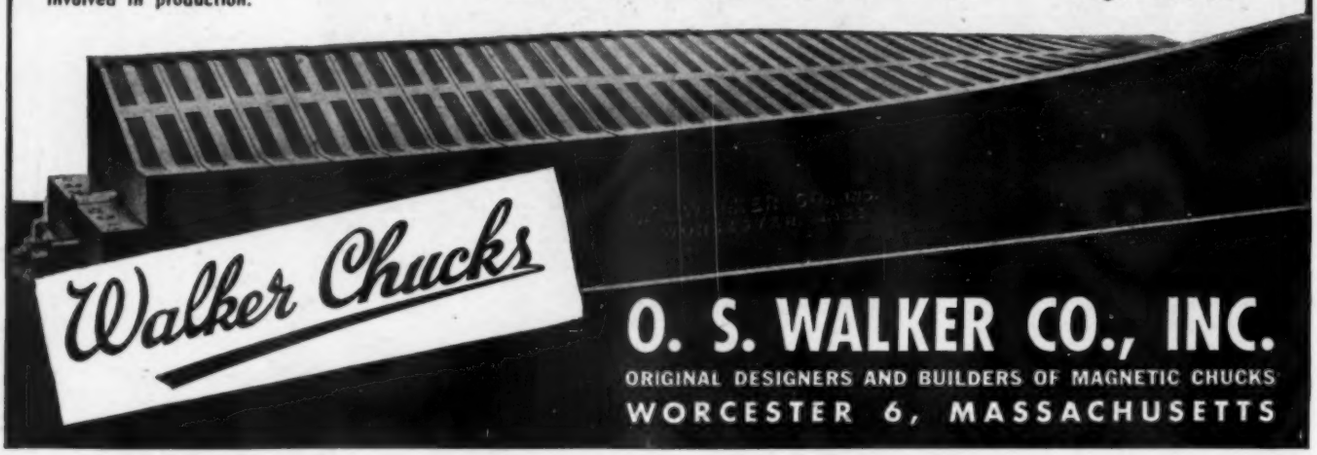
Magnetic holding of the part shown here is achieved in a chuck having sectional auxiliary top plates which are interchangeable. A substantial reduction in production cost along with increased production are being realized.

This magnetic chuck—specially designed and built by WALKER for holding aeroplane propellers during planing and milling operations—is an outstanding example of the way WALKER meets unusual conditions involved in production.



Walker Engineers—magnetic chuck pioneers—are prepared to assist you with your parts' holding problems.

SPECIFICATIONS
Width—15"
Length—71"
Height—11"
Weight—3300 lbs.



Walker Chucks

O. S. WALKER CO., INC.
ORIGINAL DESIGNERS AND BUILDERS OF MAGNETIC CHUCKS
WORCESTER 6, MASSACHUSETTS

"JO-BLOCKS" GUARD THOUSANDS OF FAMOUS PRODUCT-REPUTATIONS

A list of manufacturers using genuine Ford Johansson Gage Blocks would include a high percentage of industrial leaders. And it would include, you may be certain, many who will join the ranks of leadership tomorrow!

For the use of measurement standards of Jo-Block accuracy (2, 4 or 8 millionths of an inch, plus or minus) is a pretty sure indication of determined intent to build a reputation for product-excellence. Order a master set of Jo-Blocks and Accessories for your plant or shop, and encourage your men to acquire working sets for their own tool-kits.

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TAPPING CHUCKS
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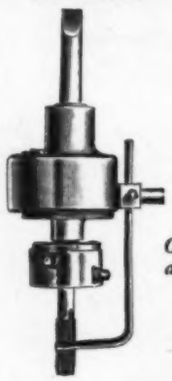
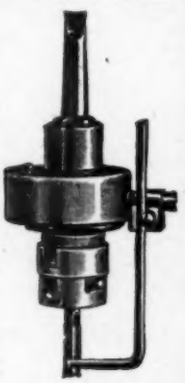


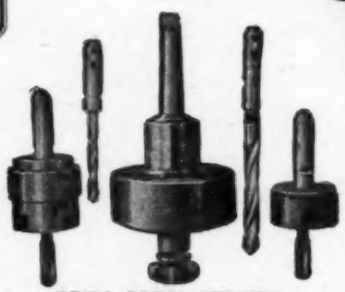
Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	1/16"
" 0	3/32"
" 1	5/32"
" 2	3/8"
" 3	5/8"
" 4	¾"
" 5	¾"

	1/8"
	½"
	¾"
	1 "
	1¼"
	1½"
	2 "



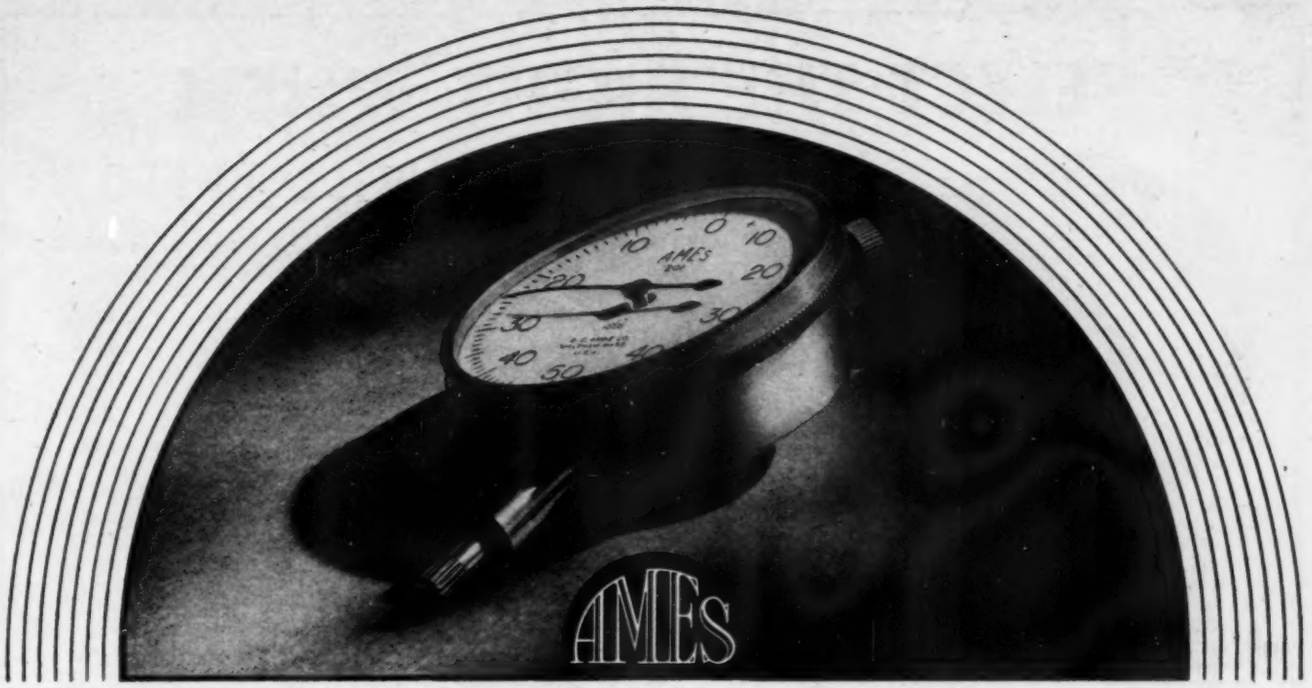
Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down



Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required.
Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.



GOOD IN THE 4TH DIMENSION, TOO!

For tool checking or tough production jobs, Ames Dial Indicators are *time*-conserving as well as sensitive and accurate. They're *quickly* mounted and adjusted. Their dials are *instantly* readable. But *most time-saving* is their ability to stay *right* on the job, without internal adjustment—*longer* than any other indicator you can buy. Send for illustrated Catalogue.

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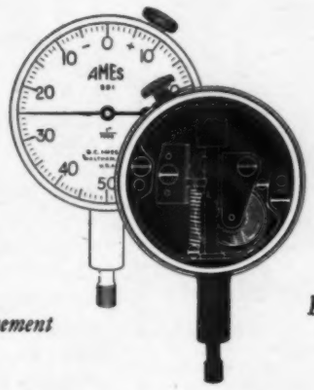
Plain or Compound Movement

Many Graduations and Ranges



Forged Brass Case and Stem

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Forged Wheel Supports

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Burnished Hardened Bearings

SELECT THE RIGHT WHEEL

AND SAVINGS WILL FOLLOW

Vitrified makes it possible to standardize on grinding wheels by offering a wide range of standard types which cover practically all wheels used on standard makes of grinding machines.

Selection of the right wheel for the work to be handled is simplified in the Vitrified catalog—a 65-page booklet which gives specific data, dimensions, etc., covering the entire Vitrified line.

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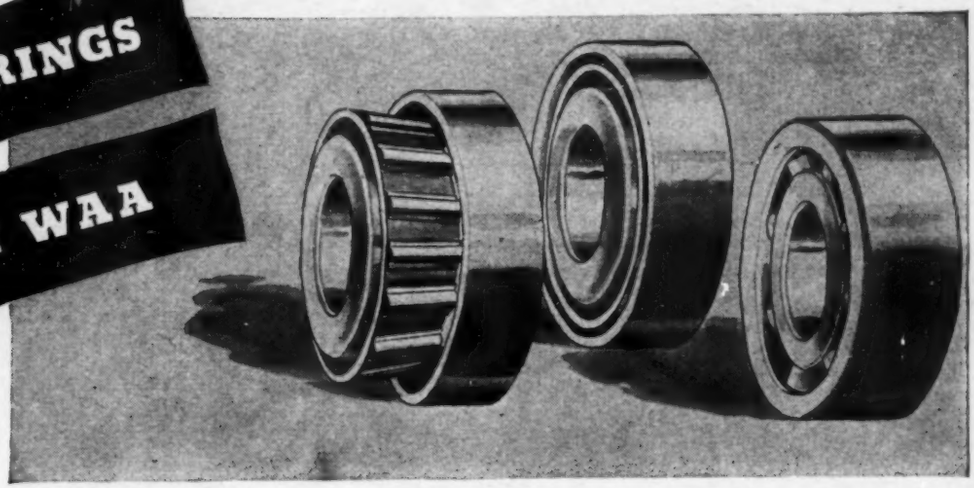
SET YOUR OWN PRICE IN SEALED BID SALES



Get your bearings from the $20,000,000 stock now being sold by WAA. Friction and anti-friction bearings and components in all sizes and types are included in this stock. Many sizes are available in production-run quantities. Set your own price on what you need and submit your bid. Get all pertinent information from your nearest WAA Regional Office—go there to make your own inspection.

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1081

Sales of bearings will be held at frequent intervals. To receive information on future sales, write, wire or phone the Regional Offices listed below asking that your name be placed on their mailing lists.

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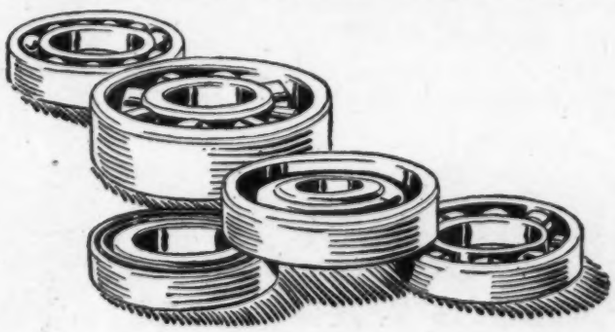

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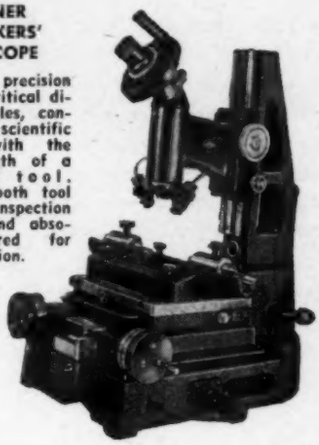
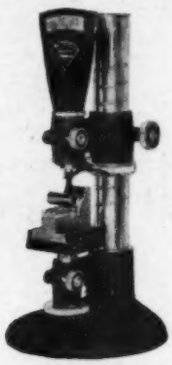
For rapid precision checking of critical dimensions, angles, contours, etc. A scientific instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department and absolutely required for thread inspection.





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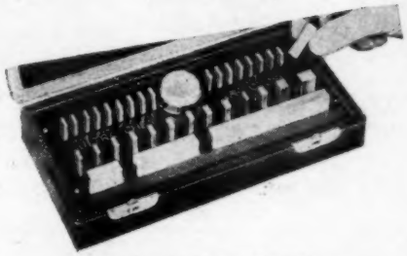

ULTRA-CHEX GAGE BLOCKS
.000005 accuracy guaranteed

A 34-block set of standards giving 80,000 combinations in steps of 1/10,000. Set includes optical parallel for testing flatness and wear.

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Magnifies and floodlights object under inspection. Can be removed from base and used as hand magnifier. Used by the hundred in both inspection and production departments. Several types for different needs.

SPENCER BINOCULAR MICROSCOPE

Permits three-dimensional vision at high magnification in inspecting small parts, contours, surface finish, etc. Choice of objectives, .7 x to 8 x and of eyepieces, 9 x to 18 x. Essential wherever materials must be inspected for surface flaws, scratches, irregularities.

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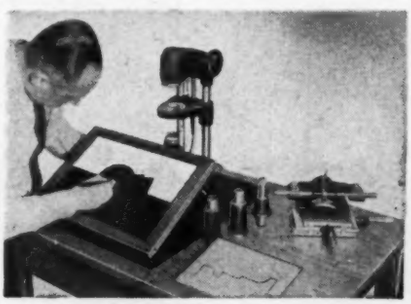
The demand of today is for closer and closer tolerances. Old-fashioned inspection methods, once the best in the world, are now outmoded. Small shops as well as big shops must meet this demand in order to survive.

The Scherr Limited Budget Inspection Laboratory was developed exactly to serve this need. The set is low in cost—well within range of small shops as well as large. Its units may be purchased separately. And in spite of its reasonable cost, it will provide all of the accuracy standards of the most modern plant.

Why not check on the Scherr Limited Budget Inspection Laboratory? Learn how easy it is for the average mechanic to operate and use modern inspection tools. Estimate how much these tools may save you, and see how they can build new profitable business. *Write us for details today.*



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Throws magnified shadow image of work for comparison with master drawing. Most accurate way to check small parts, threads, gears, odd forms. Ideal for checking tool wear on screw machines by periodical inspection of work. Many other uses. Write for descriptive bulletins.

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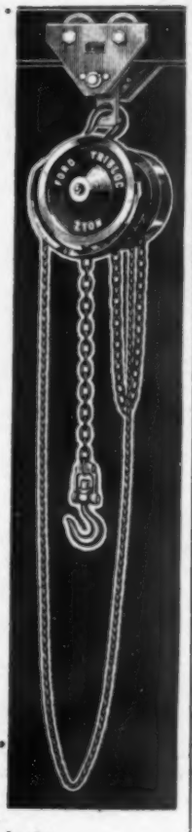
...*use* Ford Triblocs



"Handling" is a pretty important operation in shop practice. And there are just two things to remember about selecting handling equipment. First, get the right type of hoist or trolley for your particular kind of work. Second, get the best *make* you can find. So we say it again—"Use FORD Triblocs". Capacities 250 pounds to 40 tons. Fewer working parts, rugged construction, improved features add up to long-time efficiency.

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FASTER RIVETING ... NOISELESSLY

If you're faced with small riveting operations —the kind you need in a hurry—a Linley Series 10 Machine will do the job at the rate of *one rivet per second!* Available in both floor and bench models, with 3/16" diameter capacity . . . horizontal or direct-connected vertical motor. Other models with same features for 1/4" and 3/8" capacities.

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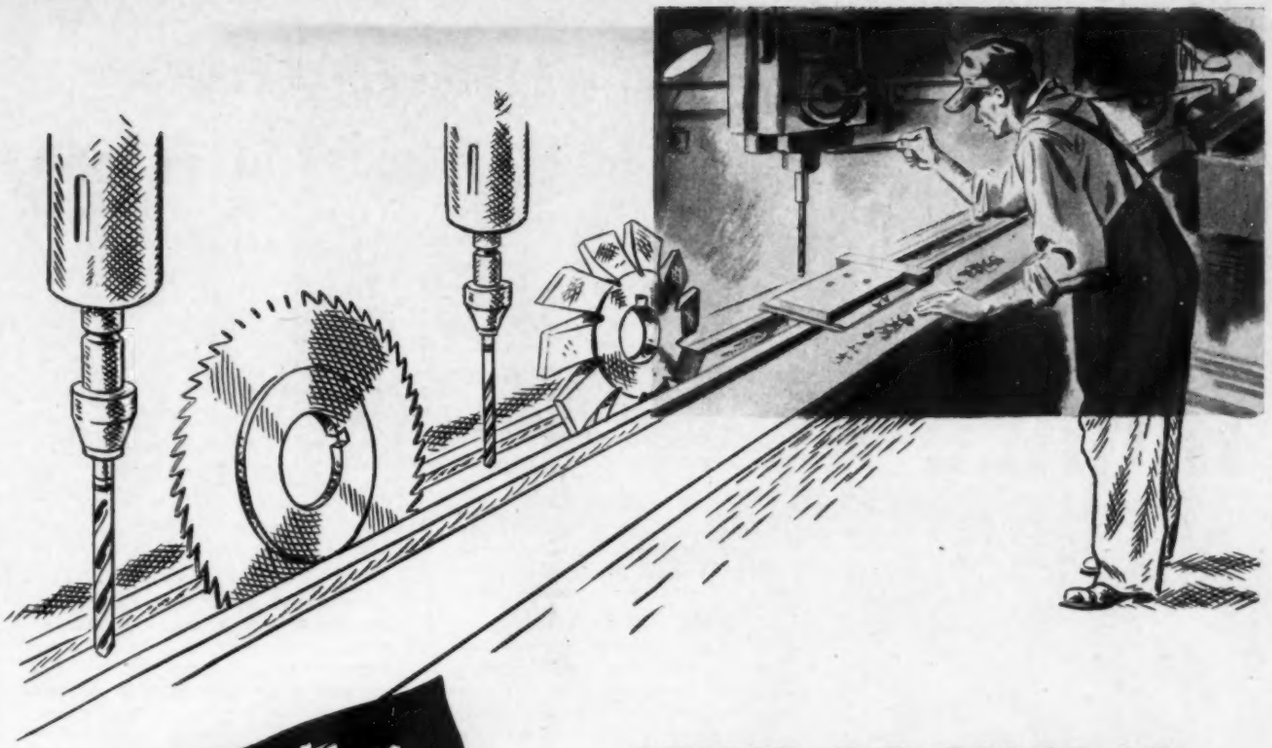

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V-grooved block

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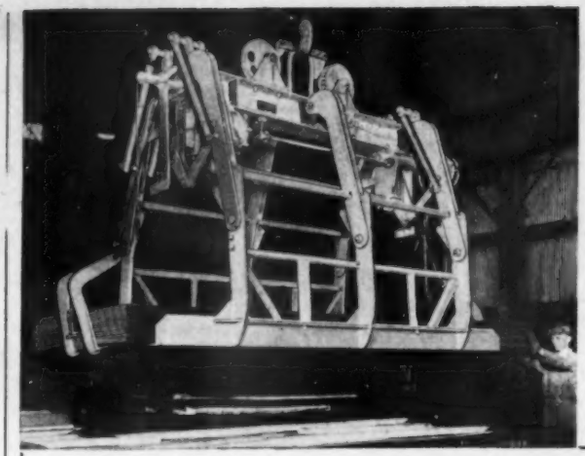

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C-F Lifters provide a faster, safer and more economical method of handling sheet stock because they carry more sheets per load, have a tong action that grips loads tightly, preventing stock slippage or sag, yet design features such as wide bearing surfaces give full protection to stock edges. One man end or remote cab control keeps operator away from sides—stock can be loaded or unloaded in close quarters with resulting savings in storage room.

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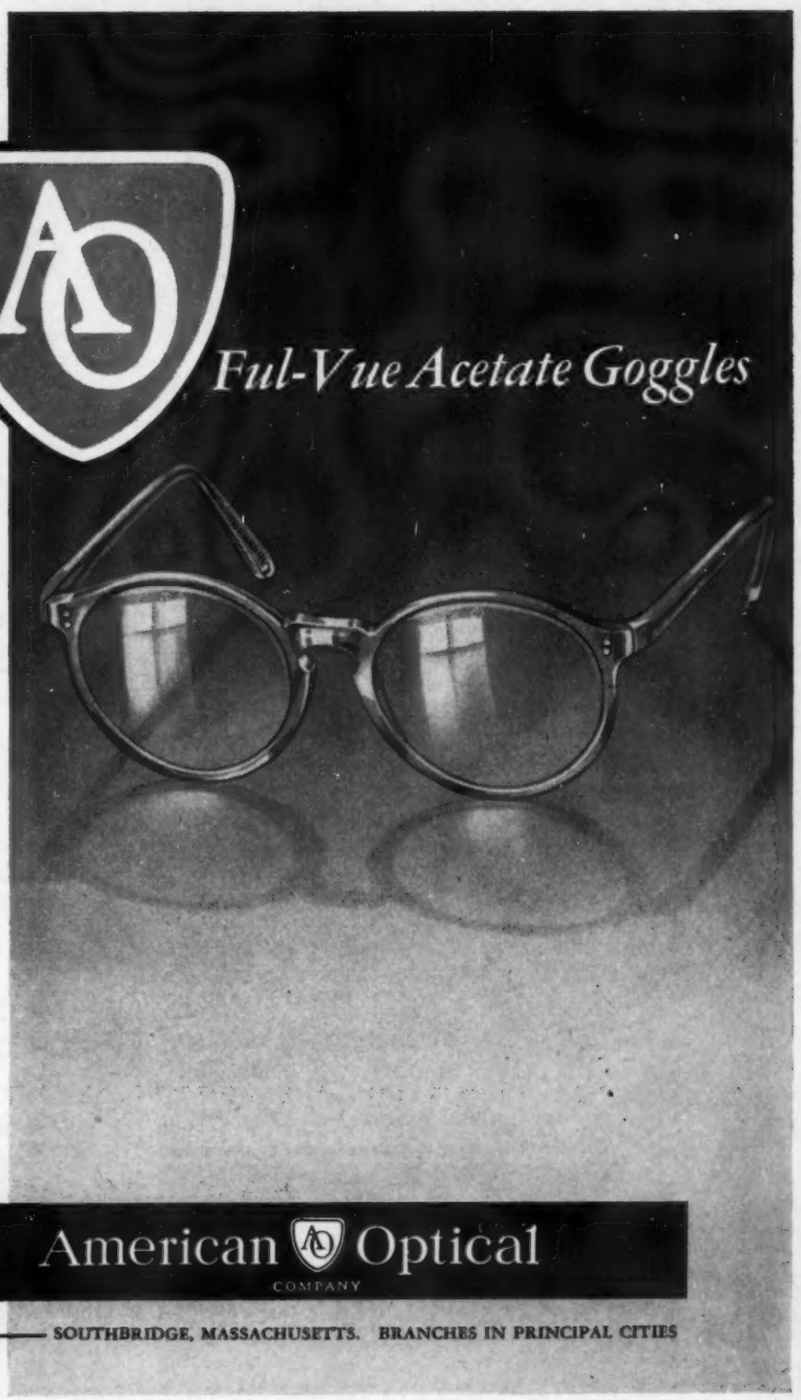

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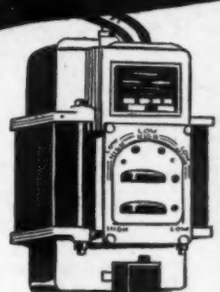

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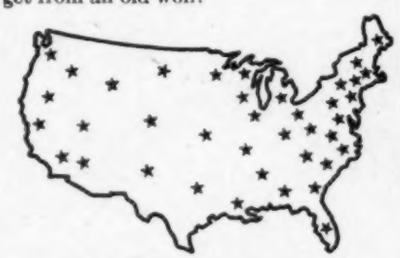

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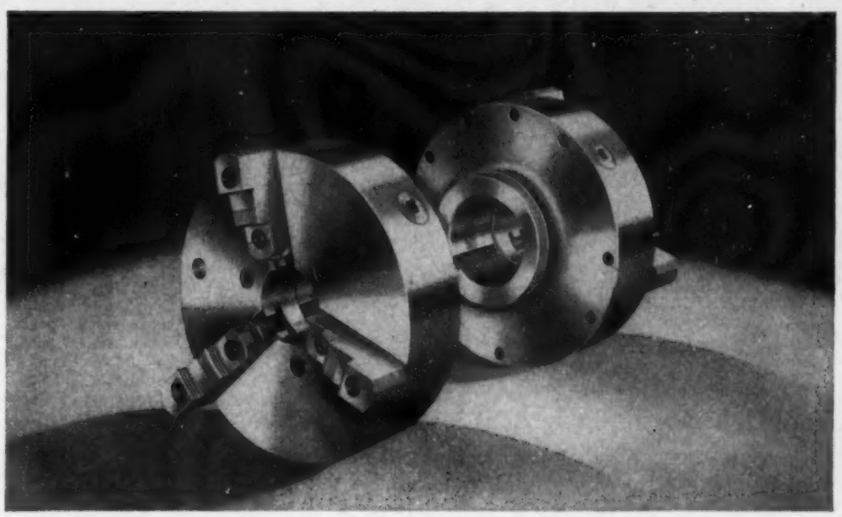

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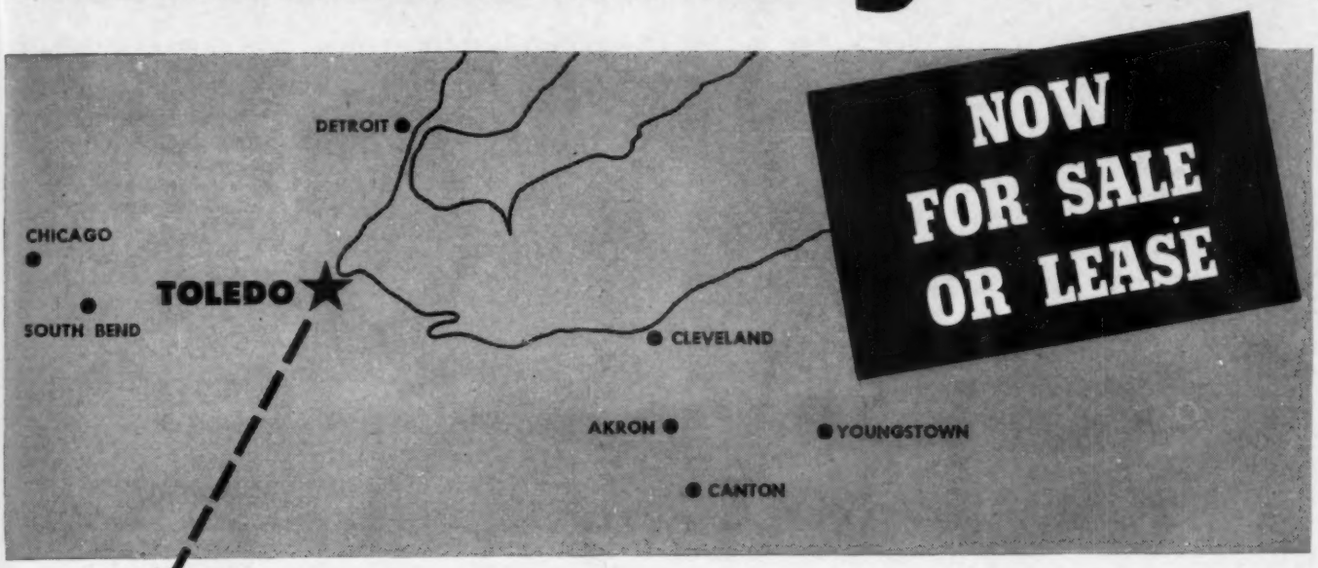

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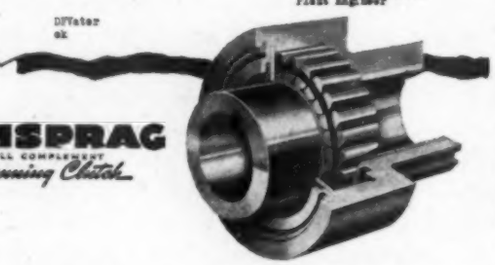

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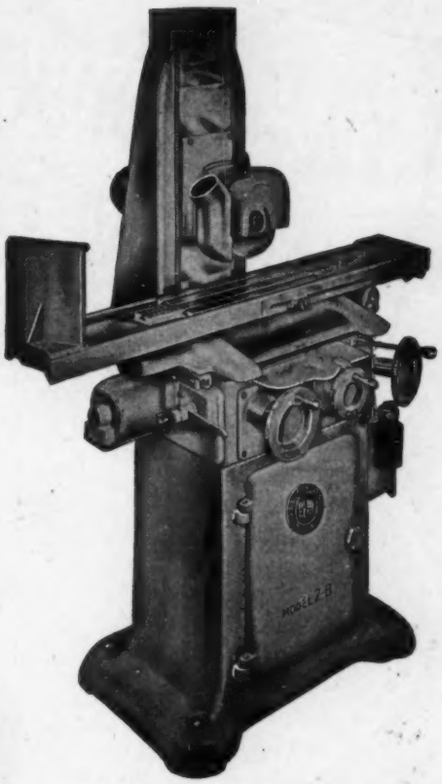

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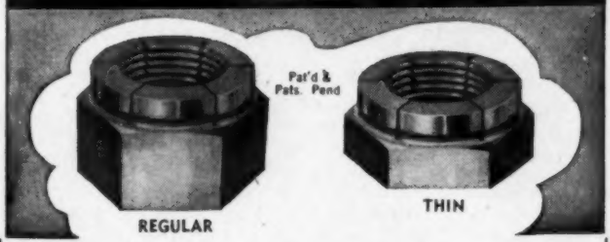

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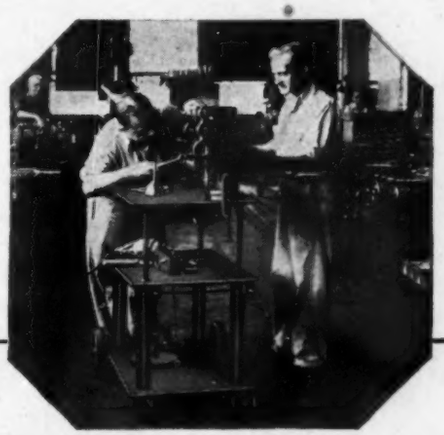

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With proven ability in machine shop and metal manufacturing. Must be capable of supervising light and heavy machine shop work, miscellaneous metal manufacturing, woodworking shop and foundry. College Graduate preferred between the ages of 35 and 40 years. This is a permanent position with well established nationally known company having a plant located on the Eastern Seaboard of Middle Atlantic States. Splendid opportunity for qualified man. Applicants should state qualifications fully in first letter and mail to

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WANTED: Experienced Design Engineer to design precision machines and equipment for rebuilding internal combustion engines, principally automotive. Excellent opportunity promising permanency and advancement offered by progressive, old-line company in middle-west. Write today giving complete personnel history enclosing recent photograph or snapshot. All information confidential. P-838, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MACHINE TOOL Painter with experience wanted by middle-west shop. Apply by letter giving age and qualifications. P-885, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

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SALES REPRESENTATIVES Wanted by large manufacturer of expansion reamers for various sections of the United States and Canada. Require individuals or organizations willing to do missionary work as well as following up on inquiries. Should have wide acquaintance in prospective territories. Commission basis. SW-901, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALES REPRESENTATIVE Wanted by manufacturer of the finest Die Sets on the market today. Territories available in all sections of United States and Canada. Must be acquainted with die work and have large acquaintance in their territories in this particular field. Commission basis. RW-908, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

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MANAGEMENT ENGINEER Graduate 25 years of successful background in capacity of top "Production Executive" and "Chief Industrial Engineer". Excellent record of increasing production and reducing costs. New York resident. PW-884, American Machinist, 330 W. 42nd St., New York 18, N. Y.

POSITIONS WANTED

PRODUCTION MANAGER or Executive Assistant, age 34. Twelve years' experience in production. Top training in industrial and personnel management, industrial engineer. Record of accomplishment. Seeks connection with progressive company in U.S.A. or South America. PW-882, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GEAR HOBBER and Threadmiller Serviceman with 11 years' road experience desires position in methods or foremanship in gear works. Former work consisted of troubleshooting, maintenance, and setup of single and rotary hobbers, threadmillers, and gear grinders, familiar with competitive makes of machines. PW-883, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WORKS MANAGER now employed, age 52, married, no dependents, seeks position as plant or Work Manager with progressive concern in the metal trades industry. Know machine tools, jigs, dies and fixtures. Go anywhere. Minimum salary $7,500. PW-909, American Machinist, 330 W 42nd. St., New York 18, N. Y.

PLANT MANAGER desires connection with medium size company. Capable of assuming full responsibility, 25 years of diversified practical, design and manufacturing experience of special machinery, precision instrument, tools, fixtures, mass production of precision gears, inspection, assembly, cost control, plant engineering, labor relation. Capable organizer with a record to get things done. Age 45, College graduate M. E. Initial salary $12,000. PW-910, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL AND Electrical Engineer of executive caliber capable of organizing and directing department. 42 years old. Solid academic background. Nine years building textile machinery. Four years mechanical side of radio. Licensed engineer in Pennsylvania and Illinois. Thoroughly familiar with machine tool and punch press operations. Now employed as chief engineer pressed metal plant. Seeks connection with progressive concern developing new lines or starting new plant. PW-911, American Machinist, 520 N. Michigan Ave., Chicago, 11, Ill.

CHIEF INSPECTOR, engineering background; able to set up modern inspection department. Supervises any machine operation. Accustomed to closest tolerances. Lay-outs, tools, fixtures. 20 years' experience. Own latest precision tools. Best references. W. Basch, 224 W. 72nd, New York 23, N. Y., Phone: TR-4-4281.

WELL-TRAINED and experienced personnel man wants position as personnel director or industrial counselor in progressive concern. Central or southwestern states preferred. Now school director of guidance, testing, and counseling in a city of 100,000. Have Phd. in guidance and personnel work besides wide background of industrial and administrative experience. Strong public relations. Norse descent; 38 years of age; excellent health; three children. Will furnish references and credentials upon request. Write or wire PW-912, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SELLING OPPORTUNITY WANTED

MECHANICAL ENGINEER with long established office and staff of competent engineers desires exclusive sales arrangement for high grade machine tool line requiring actual shop, production and engineering knowledge to sell. Have background of thirty years shop, engineering and sales experience with wide acquaintance throughout New York State. Location, central New York. RS-913, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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MECHANICAL ENGINEER, 20 years Shop, Design, and Sales Experience wishes to invest $20,000 and services in small going manufacturing business. BO-903, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ABRASIVE SALES Executive wanted to invest services and capital to act as sales manager for manufacturer BO-914, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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PATENT and Trade-Mark Practice before U. S. Patent Office Validity and Infringement Investigations and Opinions Booklet and form "Evidence of Conception" forwarded upon request. Lancaster Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W., Washington 5, D. C.

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Additional Equipment Wanted Advertising — page 318

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2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

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Sebastian Engine Lathes (new)
13"x6' Williard, geared head
14"x6' Hendey Yoke Head
14"x6' Rockford Cone drive (two)
16"x6' American Motor Driven Lathe
16"x8' Lodge & Shipley 12-speed Grd. Hd.
18"x10' American, Geared Head, Taper
20"x10' Hendey with Taper
20"x11' Schumacher-Boye, M.D.
24"x12' LeBlond Heavy Pattern
26"x18' Bridgeford geared head
28"x10' Davis cone driven
32"x16' Bridgeford geared head
48"x30' Simmons Geared Head, 1941

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3R Gisholt Universal like new
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe

TURRET PUNCHES

Hecker, vertical type, 8-station, air operated, 18" throat

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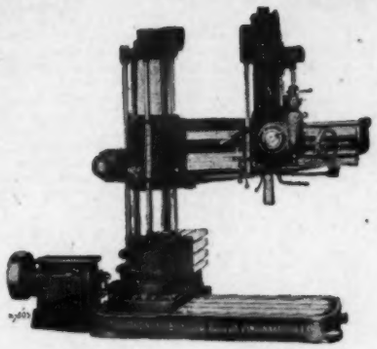
20"x20"x24" N.B.P., Planer Shaper
26"x26"x8' Gray Planer, 2 heads



RADIAL DRILLS

3½' Arm, 10" Column Cincinnati-Bickford
4' Arm, 11" Column Cincinnati-Bickford
5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
6' Arm, 15" Column Cincinnati-Bickford

Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

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2—#0 Johnston & Jennings, Jolt Squeezer Draw Pattern, 15" x 21" Table

3—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines, 23"x38" table

2—SPO Hand Rollover Power Draw Moulding Machines complete with run-out cars 22½"x60"

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Lennox Splitting Shear ¾" cap.; 8' throat
Lennox Bevel Shear, ¼" cap.
Peckstow 30"x18 ga. Squaring Shear
Niagara 48" Roller Leveller, 8 Rolls
West Co. 36" x 10 ga. 15" gap, Power Squaring Shear

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#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1 Brown & Sharpe Plain Miller
P & W 2½" Duplex Spline Miller
Thread Miller, Hall Planetary #1—24"
#8 Lees Bradner Thread Miller
#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

MISCELLANEOUS

15 KVA Ace Spot Welder, 18" throat
Toledo Spot Welders, 10 K.W., 15 K.W.

GRINDERS

Queen City Dble. End Grinders, new
#33 Abrasive Vertical Surface motor drive
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

BORING MILLS

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36

#31 Lucas Horizontal Boring Mill, 3" bar

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M.T.

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Famco Arbor & Foot Presses (new)
2—#1A Standard Bench Type Press, ¾" stroke
#4 Bliss D. C. Forging Press
200 ton A.C.F. Hydraulic Press. Bed. 24"x36", 4-post.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 48" throat

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2⅝" RA-6 Acme-Gridley Automatic Screw Machine, with bar feed rack collets, chip conveyor, motor and control. New in 1943.

14" x 60" Mattison Surface Grinder motorized, with hydraulic unit, coolant equipment, wheel truing attachment, motors and controls. New in 1943.

AUTOMATICS

★9/16" x 1¼" RA-6 Acme-Gridley Automatic Screw Machines. Bar equipment. New in 1943.
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

DRILLS

4' Canedy-Otto Radial Drill. New in 1946.
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
★ 28" Cincinnati-Bickford Super Service.
42" Cincinnati Bickford.
★ No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20" x 40".

GEAR CUTTERS

Model A Barber-Colman Gear Hobbers.
No. 3 and No. 12 Barber-Coleman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.

GRINDERS

No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Int. Grinder.
No. 72A3 Heald Gagematic Int. Grinder.
No. 3 Brown & Sharpe Univ. Grndr., m.d.
No. 13 Brown & Sharpe Universal & Tool.
★ No. 2 Cincinnati Centerless Grinder, with hydraulic profile wheel truing attachment, through feed rest, Filmatic bearings; motor driven. New in 1942.
★ Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.
★ No. 18 Blanchard Surface Grinder with 36" magnetic chuck. New in 1943.
No. 3 Cincinnati Centerless Grinder, m.d.
No. 35 Excello Thd. Grndr., new in 1943.
No. 5-VRO Hammond Buffer. New, 1943.

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12" x 30" Pratt & Whitney, g.h.
14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
17" x 6' LeBlond Regal, g.h.
18" x 12" Lodge & Shipley, g.h.
48" x 12' Lodge & Shipley, C.D.
IMP and LR Lo-Swing, m.d., new in 1940.
15" x 30" Lipe Carbo-matic, new in 1943.

LATHES, TURRET

No. 3A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h., new 1943.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 5 Warner & Swasey, Universal, g.h.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
24", 36", 42" Bullard VTL, New Era.

MILLS

No. 4A Brown & Sharpe Universal, s.p.d.
No. 3 Cincinnati Univ., motor in base.
No. 2 Cincinnati Univ., motor in base.
No. 2H Milwaukee Plain double overarm, motor in base.
No. 2-MH Cincinnati Plain, m.d.
No. 2H Milwaukee Vert., motor in base.
No. 2209 Milwaukee, Table 22" x 158".
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.

MISCELLANEOUS

No. 17 Greenerd Arbor Press.
No. 100 Micromatic Hydrohoner.
No. 1 Standard Drop Hammer.
12' x 3/16" Bertsch Combination Punch and Shear, m.d.

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16" Gould & Eberht. Crank Shaper, m.d.
★ 6" Pratt & Whitney Vertical Shaper.
36" x 36" x 12' Liberty Planer, 2 heads, box table.
42" x 42" x 20' Cin. Planer, D.C. Rev. m.d.

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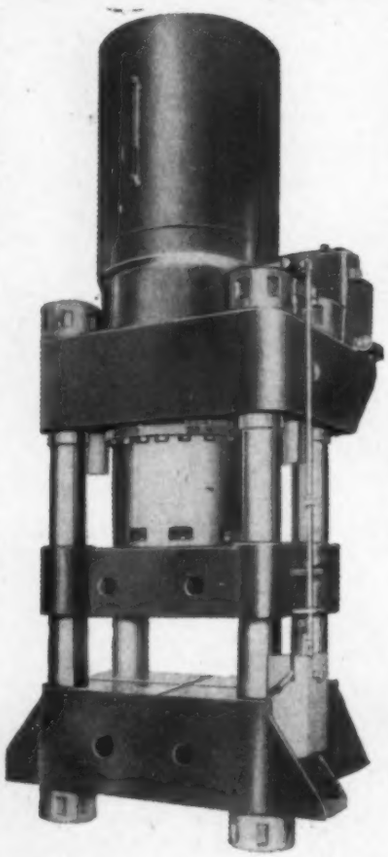

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#4HS Cincinnati Plain Miller

#3HS Cincinnati Vertical Miller

#1-18 Cincinnati Plain Miller

#2LS Lapointe Hydraulic Broaching Machine

16" x 72" Norton "C" Plain Grinder

6" x 30" Norton "C" Plain Grinder

#3 and #4 Warner & Swasey Turret Lathes

#1 Brown & Sharpe Wire Feed Screw Machines

#3 Allen 2-spdl. Drill #4 MT

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BROWN & SHARPE #20—Plain—10x18—Latest Type
LANDIS 6x18, 6x20, plain, M.D.
NORTON 10x18 Plain—motor drive
NORTON 10x36" Plain Type C, Hyd., latest type
NORTON 10x72 Plain, Type C—latest type
NORTON 10x72 Universal, HYD., Multi-purpose, Latest Type
PRATT & WHITNEY 10" Grinder, hyd.—latest type

GRINDERS, Internal, Cutter and Miscellaneous

BROWN & SHARPE #10 Tool & Cutter—latest
BROWN & SHARPE #13, Universal Tool, Latest Type
BRYANT No. 1 —10" Chucking—Internal—latest
BRYANT #5 Internal, hyd., latest type
CINCINNATI #2, #3, #4 centerless, LATEST TYPE
FITCHBURG Uni., spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD 72A3 Plain Internal, latest type
HEALD 72A3 Sizematic internal, latest type
HEALD 72A5 plain internal, latest type
LANDIS #1 Race-Way, Latest Type
OLIVER Tool and Cutter, Latest Type
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #1 Tool—Motor Drive
SELLERS #2 Tool—Motor Drive
SELLERS #4T Uni., Tool—latest type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #16, 20" Chuck, Motor Drive
BLANCHARD #27—42" Chuck—Latest
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MATTISON 12x16x48 Hyd., Latest Type
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MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type

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AMERICAN 36x25' centers—Timken Bearing—2 carriages P.R.T. Taper Attachment—Latest Type
AMERICAN 42x25' bed geared, M.D.
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BRIDGEFORD 36'x28', 36"x32' bed—2 carriages, M.D.
HARDINGE 9x54" bed, QCG, Cataract
HENDEY 14"x8' bed geared head
HENDEY 22"x8' bed, geared head
HENDEY—12x54 centers—latest type
HOUSTON, STANWOOD & GAMBLE 36x24' bed
LeBLOND 13"x4' bed, Timken Mfg.—latest
LOSWING 4x60", 4x84", 6x60", 8x84", Timken Bearing, Latest Type
LOSWING 5x34" Model LR Auto. Timken latest
MONARCH 22x48" Centers, Timken, latest
NILES 42"x60", double head, Motor Drive
NILES 48x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x15' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
PITTSBURGH 50'x30' bed—M.D.
RIVETT #918, 9x15" Centers
RIVETT #606-4-NS, 8x18" Centers

LATHES—Turret

BARDONS & OLIVER #3, #5, #7 Timken Bearing—latest type
CINCINNATI ACME #1, #5W, Timken bearing, latest
GISHOLT #3D Simplimatics—Timken—latest
GISHOLT #1L, #2L, #3L, Universal, Timken Bearing, Latest Type
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing—latest type
GISHOLT #5, Universal, Latest Type
JONES & LAMSON #3, #7C Univ., latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
MOREY 2G, #3, #4, Timken Bearing, latest
WARNER & SWASEY #2 Timken, latest
WARNER & SWASEY #4A—uni. 8" hole, timken bearing. Latest Type
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MILLING MACHINES—Mfg.

BRIGGS Type 2A, production, HYD, latest type
BROWN & SHARPE #000—Timken Bearing, Latest
BROWN & SHARPE #12 auto., Timken—latest
CINCINNATI 1-18 Mfg. Type
CINCINNATI #0-8 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI 48" duplex, automatic, SPD
KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
MOREY #12M 2 spdle, Profiler & Milling Machine
NICHOLS Hand, M.D.—Latest Type
OHIO Auto. 16"x72" table—Timken Bearing
SUNDSTRAND #3 Rigid Mill
TAYLOR & FENN M-80, Duplex Spline, Latest Type

MILLING MACHINES—Plain

CINCINNATI #3 High Speed, Dial Type, Timken Bearing, latest type
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #4S, #5, high power, M.D.
KEARNEY & TRECKER #3K—Timken—latest
KEMPSMITH #4 Maximiller—Timken—latest

MILLING MACHINES—Univ.

AMES Bench, Timken Bearing, latest type, M.D.
CINCINNATI #2, Motor Drive
CINCINNATI #2, Dial Type, High Speed, Timken
VAN NORMAN 22L, Timken Bearing, Latest Type
HARDINGE Bench, Timken Bearing, Latest Type

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2 Dial Type—Timken—latest
CINCINNATI #3, #4 High-powered, Motor Drive
CINCINNATI #4, High Speed, Dial Type, Timken
COCHRANE BLY Univ. Vert. Miller, M.D.
KEARNEY & TRECKER 2H, 2K, 3H, 3K, 4H, 4K, Timken—latest type

PLANERS

CINCINNATI 48x48x20', 3 heads, AC M.D.
CHANDLER 36x36x20' 4 heads AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 48x48x12 Openside, AC, M.D.
LYND FARQUHAR 26" Opensida, motor drive
NBP 54x54x12', 2 heads, box table, AC, M.D.
NILES 48x48x12'—Time Saver—3 heads, P.R.T., box table, DC, M.D.—latest type
NILES 48x48x16', 4 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC
POND 48x48x16' 2 heads, AC, M.D.

SAWS

BRIDGEPORT #48W Abrasive
ESPEN LUCAS #136—Cold Saw, M.D.
GROB OS-20—band and filing—Latest Type
PEERLESS 14x14 Hack; latest type

SHAPERS

CINCINNATI 24" Crank—Motor drive
CINCINNATI 26" Travel Head—2 head Type B
LAMAIRE 18" Vert. Hydraulic—latest type
MOREY 8", 10", 12", 14", Vertical, Latest type
NEWTON 15" vert. slotter, D, M.D.
MILES 18" ver. slotter, DC, M.D.
PRATT & WHITNEY 6", 10", Vertical, Motor Drive

THREAD MILLING MACHINES

HALL—Planetary, M.D.—Latest Type
HANSON & WHITNEY 4 x 9, Latest Type
MOREY SHIELDS 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, Model "C"—Latest
PRATT & WHITNEY 6x132—Motor Drive
PRATT & WHITNEY 6x20 Model "C"—Latest
SMALLEY General #20 MB, Motor Drive

AUTO. SCREW MACHINES

BILLINGS & SPENCER B-2 Diametic—Latest
CLEVELAND ⅞" to 2½" Model A
CONOMATICS 3½" 4 spindle—latest type
CONOMATICS 2⅝"—6 spindle, Latest Type
NATIONAL ACME 9/16" mod. C, 5 spdle., M.D.

BORING MILLS—Horizontal

DETRICK & HARVEY—5" bar—floor type—motor drive
FRANKLIN 4½" bar, single pulley drive
LANDIS #35—3½" bar—floor type
LUCAS #33—4½" bar, motor drive
NILES BEMENT POND 5", 6", 7" bar—floor type
OHIO #5F-420 5" bar, floor type, latest type
P & H #10, 3½" bar, floor type, M.D.
UNIVERSAL #40—4" Bar, Motor Drive

BORING MILLS—Vertical

BETTS 120"—2 swivel heads, motor drive
BETTS (Consolidated) 100"—2 heads, DC, Latest type
BETTS (CONSOLIDATED) 84" 3-heads, DC Latest
BULLARD 24", 36", New Era Type, M.D.
BULLARD 42", Spiral Drive, latest type
BULLARD 80"—2 swivel heads, motor drive
CINCINNATI Hypro 84" 3-heads, AC Latest Type
COLBURN 72" 2 swivel heads, AC, M.D.
KING, 30' Vert., M.D.
KING 30" Motor Drive, Latest Type
KING 60" 2 swivel heads PRT AC, M.D.
NILES 40"—2 swivel heads, power rapid traverse
NILES 73", 2 swivel heads, PRT, AC, M.D.

DRILLS

BAKER #121 Single spindle—latest type
BARNES #H3, Hydram, latest type
BARNES #210—single spindle—latest
BODINE 42-20, 42-30 automatics—M.D.
COLBURN #14, 2 spindle heavy duty, AC, M.D.
EDLUND #1B, #2B, #2MB, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
PRATT & WHITNEY No. ½Bx50" 2 spindle. Deep Hole latest type

DRILLS—Radial

AMERICAN 3½'9"—Maxi-Speed, Motor Drive
AMERICAN 4'11"—5'11"—5'13" AC, M.D.
AMERICAN 7' Triple-purpose, M.D.
AMERICAN 3'11", hole-wizard, Latest Type
CANEDY OTTO 3'11" New
CARLTON 4'13", 5'14", 6'15"—M.D.
CINCINNATI BICKFORD 4'13", 6'19"
DRESES 5'13", AC, M.D.
DRESES 5'15" Universal, AC, M.D.
FOSDICK 5'14", AC, M.D.
MUELLER 4½'9", AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
RYERSON 4'11" AC, M.D.
WESTERN 3', 4'18", 5'18", 6'20", latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type A Hobber—latest
BARBER COLMAN Type S, #3, latest type
BARBER COLMAN #12, Gear Hobber
BROWN & SHARPE #3H gear cutter, M.D.
FELLOWS #7, #7A type, all models, latest
FELLOWS #6, #6A type, all models, latest
GLEASON 6", 11", 18" bevel gear generator, M.D.
GLEASON #13 tester, M.D.
GLEASON 15" Quenching Press
GLEASON 24" Bevel Gear Planer
GOULD & EBERHARDT 12 H.S., Latest Type
GOULD & EBERHARDT 18H Hobber with in-feed, differential, M.D.
HERCULES 24" HOBBER, differential, M.D.
NEWARK #5, Latest Type
SCHUHARDT & SCHUTTE #1

MISCELLANEOUS

BARNES #420 2-spindle deep hole Drill—Hyd.—Latest Type
BAUSH Radial Tapper—latest
CASCADE #120 Industrial deep freeze
FERRACUTE No. DG55, Drawing, latest type
GENERAL ELECTRIC 100KW Generator
LaPOINTE #3L Broach, horiz. hyd. 15 ton cap.
LeBLOND #2 deep hole borer, latest type
MORTON 60" combination travelling head planer, milling and drilling, motor drive.
NILES 30"x50' deep hole borer, Timken—latest
PRATT & WHITNEY 3-B Jig Borer—Latest type
SHUSTER #1 Wire Straightener
TREADWELL 12"—Pipe Threader—Motor Drive
WHITON 8x108 centers duplex centering, M.D.
YATES AMERICAN J-70, Woodworking Latho, latest
YODER Multiple tube cutting machine—latest

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#OG&L Spd.
2½" Cleveland Spd.
2½", 4" Binsee
66" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36".
Acme #2 M.D.
No. 1L, 2L Gisholt Univ. M.D.
No. 3 W & S Grd. Hd., Univ., M.D.

GRINDERS

P. & W. 14", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
No. 55, 60, 65 Heald int. Hydraulic, M.D.
12" Heald Rotary Arter 12" M.D.
B. & S. No. 2, 2B Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 1, 3 Universal
#25, #55 G. & L. M.D.
#25A Heald, M.D.

LATHES

10"x3' South Bend, M.D.
Monarch geared head
26x12' Boye & Emmes 3 step cone B.D.G.
14"x6', 16"x6' Hendey
9" LeBlond Automatic
36x30' Putnam M.D.
36x22" Putnam, D.C. M.D.
32"x35' Wickes
Putnam 42x16', M.D. S.C.G.
P. & W. 1x18, Automatic Lathes

AUTOMATICS

Cleveland Model A ½", ⅞", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle, Gridley

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RADIALS

4', 5', 6' American Triple Purpose
4', 5' Cincinnati-Bickford
4' Muller, M.D.; 4' 5' Western, S.P.D.
4' Fosdick

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#2HL Milwaukee, M.D.
No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 2, 3D Profiler M.D.
K. & T. B. & S., No. 2, 3 like new
B. & S. No. 1, 3, Vert.
#22L Van Norman Univ.
#2B K & T Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine 3Z
6 spindle Avey Drill 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper P & W
Oster Pipe Machines, 4", 6"
N.B.P. 15" Slotter M.D.
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Lennox Throatless shear ¼" cap., M.D.
Decker Engraving Mchs., G1, G2

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⅞" & 1¼" Cone 4 spindle
1⅛" Cleveland 4 spindle
2"x18" Cleveland Model B
12"x63" & 14"x19" Fay
14"x18" Monarch Magna-Matic
No. 454 New Britain chucking
Gisholt simplimatic

BORING MILLS

3½" bar Universal horizontal
3⅛" bar Giddings & Lewis horiz.
4¾" bar, No. 300 Giddings & Lewis floor type
100" Niles Bement Pond heavy pattern
96" Cincinnati Massive Pattern
60" Colburn
53" Niles Bement Pond
24", 36" & 42" Bullard
10D Moline cylinder borer

BROACHES

No. 2 S LaPointe
Twin 10 Oilgear duplex
VI Foote Burt duplex surface
3XA Oilgear
HP50 Lapointe
XB12 Oilgear duplex
No. 3 Lapointe double screw
12 ton V50 American vertical
30 ton V48 American vertical

DRILLS

24" Cint. Bick Super Service upright
21"x74" Munson double end
No. 00S Garvin double end
4-spdl. #3 Leland Gifford
21" & 24" Cincinnati upright
24" No. 23 Foote Burt Heavy Duty
34-spdl. #30 Natco

GEAR HOBBERS

Nos. 8H, 12H & 16HS Gould & Eberhardt
Nos. 3 & 12 Barber Colman
Mod. T Barber Colman taper spline
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner

LATHES, TURRET

Nos. 4 & 5 Warner & Swasey universal
Nos. 3-B & 5 Foster universal
Nos. 3 & 5 J. & L. universal
16"x6' South Bend
Nos. 3 & 5 Foster
24" & 42" Bullard vertical
28" Gisholt
3"x36" & 4"x34" Jones & Lamson

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8 & 20 ton General Flexible
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1000 ton Lake Erie hydraulic

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1½" & 2" Acme
3" National

MISCELLANEOUS

#10-D Moline Cylinder borer
#112-C Ex-Cell-O precision borer
Nos. 2 & 3 Cincinnati centerless grinders
No. H-1 Micromatic Hydrohoner
#211 Barnes honer
No. 9 LeBlond Multicut lathe
6", 8" and 15" Sundstrand automatic stub lathes
#12-B Pratt & Whitney profiler
Model J Radiac abrasive saw
#11-B Badger alligator shear
4" Stevens ore slotter
16" Bement Miles slotter
#2 Garvin tapper
90 KVA Fisher body seam welder

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F-2	12.00	"	"	"	"
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J-2	18.00	"	"	"	"
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N-2	32.00	"	"	"	"

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No. 45 GIDDINGS & LEWIS Horizontal Boring, Drilling & Milling Machine, Table Type 5" spindle, No. 6 Morse Taper, Table 72"x36"—20 HP—3/60/220 motor drive.

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Tow 1¼" 4 spindle Cone Automatic Screw Machines, new in 1929, with motors, loads of extra tooling and threading, $600.00 each.

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4 spindle 7/8" Cleveland Model M, m.d.
4 spindle 2" Cleveland Model M, m.d.
2¼" Cleveland Model A, m.d.
2½" Cleveland Model A, m.d.
4 spindle 2¼" Cleveland Model K, m.d.
2¼" Gridley, m.d.
4¼" Cleveland Model A, m.d.
4½" Cleveland Model A, m.d.
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.
No. 4D Potter & Johnston, m.d.
No. 6A Poter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, m.d.
20x25" Jones & Lamson, m.d.

HORIZONTAL BORING MILLS

No. 31 Lucas, m.d., 3" bar
No. 0 Giddings & Lewis, m.d., 3⅛" bar
No. 21 Lucas, m.d., 2½" bar
No. 32 Giddings & Lewis, m.d., 3⅛" bar
No. 33 Lucas, m.d., 4½" bar
No. 45 Giddings & Lewis, m.d., 4½" bar
2½" Cleveland, m.d.
4" Detrick & Harvey, floor type, m.d.
4" Niles, m.d.
4" Landis, m.d., floor type
4½" Niles, m.d.
5½" Niles, m.d.
6" Niles-Bement-Pond Floor Type, m.d.
10" Sellers Floor Type, m.d.
Morton 60" stroke Boring Mill and Draw-Cut Traveling Head Planer, m.d.

SHAPER

24" Cincinnati Traveling Head, m.d.

THREAD GRINDER

No. 33 Excello Precision, m.d., latest type

RADIAL DRILLS

3' Fosdick, gear box
3' Cincinnati-Bickford, gear box
3' American Triple Purpose, m.d. on arm, 11" col.
3' American Sensitive, belt
3' Fosdick Sensitive, belt
4'-11" American Triple Purpose, gear box
4'-13" Cincinnati-Bickford Super-Service, m.d. on arm
4'-13" Cincinnati-Bickford, gear box
4'-13" Carlton, m.d. on base
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d.
5' Prentice Plain, m.d.
6' American Triple Purpose, m.d. on base
6'-15" Carlton gear box on base
6'-15" Cincinnati-Bickford Super-Service, m.d. on arm
6' extended to 7' Cincinnati-Bickford, m.d. on base
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western m.d.
8'-16" American Triple Purpose, m.d. on arm
8'16" American Triple Purpose, m.d. on base
10'-22" American Triple Purpose, m.d. on arm

HORIZONTAL DRILLS

No. 1 Pratt & Whitney 2 spindle Deep Hole, m.d.
No. 1B—50" Pratt & Whitney Deep Hole, m.d., latest
No. 1½ Pratt & Whitney 2 spindle Deep Hole, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole, m.d., latest
Snyder Tool Co. Double End Boring Machine, m.d.
Pratt & Whitney Rifling Machine, belt
No. 420—2 spindle W. F. & John Barnes Deep Hole, m.d., latest
5 spindle Detroit Semi-Automatic, belt
No. ½Bx50" Pratt & Whitney Chambering Machine, m.d.

UPRIGHT DRILLS

24" Cincinnati-Bickford, m.d.
28" Cincinnati-Bickford, belt
30" Rich H.D., m.d.
32" Aurora, belt
H3 Barnes Hydram, m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., s.p.d.
No. 25 Foote-Burt H.D., s.p.d.
No. 36 HO Baker H.D., m.d., latest

ENGINE LATHES

13x48" Pratt & Whitney Model B Geared Head, m.d. in base, taper
14"x6' American Geared Head, m.d., taper
14"x5' Springfield Geared Head, m.d.
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x8' Pratt & Whitney, cone
16"x6' Bradford, cone, taper
16"x6' Hendey Geared Head, m.d., taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' Sebastian Type H Geared Head, m.d., in base, latest
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Champion, cone
18"x8' Greaves-Klusman, cone, taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone, motorized
18"x8' Whitcomb-Blaisdell Geared Head
19"x10' LeBlond Geared Head, m.d.
20"x8' Cisco, cone
20"x8' Springfield Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American Geared Head, m.d., taper
24"x10' American M.P., cone
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley Selec. Head, m.d.
24"x10' Greaves-Klusman Geared Head, m.d.
24"x10' Whitcomb-Blaisdell Semi-Quick, cone
24"x12' American, cone
24"x12' Reed-Prentice Geared Head, m.d.
24"x12' LeBlond, cone
24"x20' Lodge & Shipley Selec. Head, m.d.
24"x20' Lodge & Shipley, cone
25"x10' LeBlond, cone
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d., taper
30"x26' Lodge & Shipley Selec. Head, m.d.
36"x10' Putnam, motorized
36"x12' Wright, cone
36"x12' Lodge & Shipley Selec. Head, m.d.
36"x21' centers Putnam Geared Head, m.d.
36"x28'6" Niles H.D., m.d., latest
36"x30' Lodge & Shipley Selec. Head, m.d.
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" Niles H.D., m.d., latest
50"x204" centers LeBlond H.D. Geared Head, m.d., taper, latest

UNIVERSAL MILLING MACHINES

No. 2L Cincinnati, m.d. in base, latest
No. 3 H.P. Cincinnati, m.d.
No. 4A Brown & Sharpe, m.d.
No. 4G LeBlond, s.p.d.

VERTICAL MILLING MACHINES

No. 2, 3, 4 Cincinnati H.P., m.d.
No. 2M Cincinnati, m.d.
No. 2H Milwaukee, m.d. in base, latest
No. 2K Milwaukee, m.d. in base, latest
No. 2½B, 3B Milwaukee, m.d.
No. 3 Cincinnati, m.d. in base
No. 3V Toledo, s.p.d.
No. 3V Van Norman, m.d. in base, latest
No. 4 Cincinnati, m.d., Timken
No. 4H Milwaukee, m.d. in base, latest
No. 4K Milwaukee, m.d. in base, latest
No. 4 Kearney & Trecker, m.d., dial feed in front
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest type
No. 6 Becker, cone
No. 28-60 Cincinnati 2 spindle Vertical Hydro-Tel, m.d., latest

PLANERS

32"x32"x16' Gray, belt, 2 heads
36"x36"x10' Detrick & Harvey Open Side, belt, 3 heads
36"x36"x10' Niles, 2 heads, belt
36"x36"x12' Powell, 2 heads, belt
36"x36"x16' Gray, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belt
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, reversing m.d., 4 heads
48"x48"x30' Cincinnati, 4 heads, m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted motor drive

MANUFACTURING LATHES

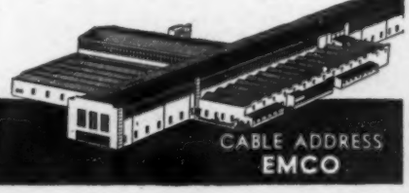
No. 9 Heavy LeBlond Mutli-Cut, m.d.
3½x36", 3½x80" LoSwing, s.p.d.
4x60" LoSwing, m.d., latest
8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand Mfg.
9x14" Porter-Cable Mfg.
13x24" Coulter Automatic Threading, m.d.
13x96" centers Automatic Threading, m.d.
15"x6' Automatic Threading
16"x6' Cincinnati, m.d. in base
17"x6' LeBlond Auto. Mfg., cone
17"x8' LeBlond Rapid Production Geared Head
17x124" centers LeBlond Rapid Production, m.d. in base, latest
20"x8' LeBlond Mfg., m.d.
No. 4 R. K. LeBlond Boring Lathe, 37' bed, 14'4" boring length, 13" hole thru spindle, latest type
Niles-Bement-Pond Quartering Machine, new

MANUFACTURING MILLING MACHINES

No. 00 Sundstrand Hydraulic Feed Rigidmill, m.d., latest
No. 08 Cincinnati Model EA Plain Automatic, m.d., new, latest
No. 1-18 Cincinnati Plain Automatic, m.d. in base, latest
No. 2-24 Cincinnati Plain Automatic, m.d. in base, latest
No. 3-24 Cincinnati Plain Hydromatic, m.d. in base, latest
No. 3-36 Cincinnati Duplex Hydromatic, m.d.
No. 34-36 Cincinnati Duplex Hydromatic, m.d. in base, latest, tracer control
No. 4-48 Cincinnati Plain Hydromatic, m.d. in base, latest
18" Cincinnati Mfg. Type, m.d.
18" Cincinnati Plain Automatic, m.d.
24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
28" Cincinnati Plain Automatic, s.p.d.
48" Cincinnati Duplex Automatic, m.d.
No. 56-72 Cincinnati Plain Hydromatic, m.d.
No. CT-36 Lees-Bradner Thread Miller, m.d.
No. CT-54 Lees-Bradner Thread Miller, m.d.
Hall Planetary Thread, m.d.
4½x12", 6x14", 6x48", 6x80" Pratt & Whitney Thread, motorized
6x20" Pratt & Whitney Thread, m.d. in base
30"x12' Ingersoll, m.d., 2 heads on rail
24"x6' Ingersoll Slab, m.d.
36"x24"x8' Ingersoll, m.d., 1 rail, 2 side heads
108"x72"x26' G. A. Gray Double Housing Milling Planer, 4 planer heads, 1 removable milling head, m.d.
10x24" Hanson-Whitney Thread Miller, m.d.

LET US QUOTE ON YOUR REQUIREMENTS.

MORE THAN 2,000 MACHINES IN STOCK



THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS
EMCO

IN STOCK

LATHES

12"x18" Lipe Carbo, M.D.
18"x6' American Grd. Hd.
18"x48" Monarch, Keller attachment (1942)
22"x48" Monarch, (1943)
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head
42"x30' American Grd. Hd.

MILLING MACHINES

No. 2H Milwaukee Vertical (1942)
No. 2 Cincinnati Med. Spd. Vertical (1942)
No. 3 Cincinnati Vertical
No. 3 Milwaukee Vertical M.D.
No. 3K Milwaukee Vertical
No. 4 Cincinnati Med. Spd. Plain (1941)
No. 4 Cincinnati Plain, Motor Drive
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
No. 27MB Smalley General Thread
No. 2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread
24"x24"x12' Ingersoll Adjustable Rail
26"x25"x12' Ingersoll Adjustable Rail

DRILLS

D-8 Colburn Hvy. Duty
No. 2-8 Spdl. Leland-Gifford
3' Morris Mor-Speed Radial, 9" Col.
3' Morris Mor-Speed Radial, 11" Col.
4' Cinn-Bickford, 9" Col.
7' American full Universal Radial
7' Carlton, Motor on arm
7' American Hole Wizard, 17" Col.

VERT. BOR. MILLS

34" King
42" Bullard New Era Vertical Turret
72" Cincinnati
72" Niles Extra Heavy

HOR. BOR. MACHINES

3½" Bar Cinn-Gilbert, Table Type
No. 25-C, 3¼" Bar Defiance, Table Type
No. 360-F Giddings & Lewis
No. 560-F Giddings & Lewis

GEAR MACHINES

No. 7 Fellows Gear Shaper
12" Michigan Gear Shaver

PLANERS

36"x36"x8' Woodward & Powell

TURRET LATHES

No. 2 American Brass Lathe, M.D.
No. 2 Brown & Sharpe, Wire Feed
No. 1-A W & S Univ. Speed Selector (1941)
No. 5 Jones & Lamson Univ.
18" Libby—3½" Hole—M.D.

GRINDERS

No. 22—12" Heald Rotary Surface
10"x24" Landis Universal, M.D.
No. 34 Abrasive surface
No. 2 Cincinnati Tool & Cutter
Norton Motor Driven Grinders practically all sizes from 6x18 to 24x240.

APPROVED WAA DEALER CHI-9

HILL-CLARKE MACHINERY COMPANY
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PUNCH PRESSES

IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 10 H.P. motors and controls, forced feed lubrication. 21x27 bolster 4½" stroke. In both Single and Double Action Models. Like new.

No. 6 BLISS 90-125 Ton Capacity, straight side Punch Presses, late model. With scrap cutters, double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke. In both Single and Double action models. Like new.

35 ton Bliss Gap Frame Punch Presses, 4-8" stroke, latest design.

1—#87 BLISS Press, 175 Ton cap. 32" stroke, late model.

#666 Toledo, Knuckle Joint Press. 1000 ton cap. 37x21 bolster, 5" stroke, very good condition, all electrical equipment.

SPOT WELDERS IMMEDIATE DELIVERY 5-300 KVA, Brand new. 5 year guarantee.

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SPRING BARGAINS
Immediate Delivery

FLETCHER Brand New Model 26 Chip Wringer, Motor Driven.

HEALD #47A Boromatic Machine, Motor Driven.

WATERBURY FARREL 4 Ton #0 Blanking Press.

BARDONS & OLIVER #2 Electric Head Turret Lathes.

GISHOLT #3AL Bar & Chucking Univ. Turret Lathe with Cross Sliding Turret.

HENDEY 4C x 42" Engine Lathe, Motor Driven.

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National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer
Cincinnati 36" x 36" x 16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
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STOCK TOOLS — *Prompt Shipment*

BOLT CUTTERS, No. 22 Murchey, Dble. Hd.
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" and 4½" bar Universal.
BORING MILL, No. 0 G & L, 3½" bar.
BORING MILL, Hor. 3½" Landis, Floor Type.
BORING MILL, 36" Bullard, "New Era".
BORING MILL, 60" N-B-P, 2 heads, M.D.
BORING MILL, 40" King, 2 heads, M.D.
BROACH, Hr. Hyd. XA Oilgear, 60" stroke.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
DRILL, Radial 6' Cinc.-Bickford, M.D.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface, No. 5 Abrasive, 14"x48".
GRINDER, Surf., Hyd. G & L, 14"x18"x72"
HAMMER, Board Drop, 1,000#, B. & S.
HOISTS, Monorail, 3 ton, Detroit, D.C.
KEYSEATER, No. 2 Mitts & Merrill
LATHE, 22"x8' L & S, Sel. Grd. Hd.
LATHE, 24"x10' L & S, Sel. Grd. Hd.
LATHE, 24"x10' Boye & Emmes, Grd. Hd., Timken Brg., m.d.
LATHE, 27"x18" Niles "Timesaver," Grd. Hd., m.d.
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MULT-AU-MATICS, Bullard, Type A, 6-Spdle.,m.d.
PUNCH, Beam, L & A, Size "A" cap. 24" beams
PUNCH & SHR., No. 15 W & W. Dble. End.

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UNUSUAL VALUES

Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drills, 21" Royersford Bk Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindles
Drill, #25 Foot-Burt motor driven
Drills—New—18" Royal Motor driven (10)
Gear Cutter, Brown & Sharpe #3—26
Gear Cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer, 24"x24"x6' Pease motor drive
Punch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathe, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

FOR SALE

Three #35 Excello Thread Grinders with all attachments and accessories; in excellent condition; three years old; operation hours less than 1,000.

Price for Immediate Sale $6,500.00 Each.

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AT TREMENDOUS SAVINGS

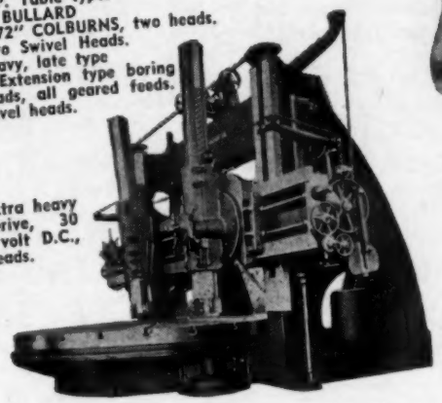
SMALLEY GENERAL THREAD MILLERS, 24" swing 30" centers, (15)
FOOTE-BURT VERT. 9 sp. Hyd. Drills, #4 & #5 MT. Rotary Table (5)—Crank Balancing Machine
LAPPING MACHINES, #20 Ultra Lap (4)
#412 New Britain Gridley 4 Sp. Automatic Chuckers (3)
Model R14, Seneca Falls Automatic Le-Swing Lathes (8)
Model LR 5"x22" Seneca Falls Automatic Le-Swing Lathes
Milwaukee Model M-24 Simplex Mfg. Milling Machine
Cincinnati Model 0-8 Vertical Milling Machine
Lees Bradner Model 40 Thread Millers
32"x14' Engine Lathe
36"x14' Ingersoll Slab Miller

CONTINENTAL SALVAGE & MACHINERY CORP.
1836 Euclid Ave. Cleveland 15, Ohio

SIMMONS BEST BUYS

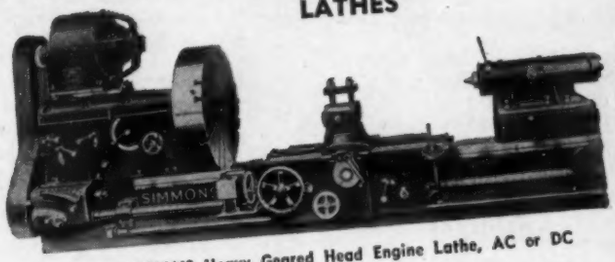
BORING MILLS

9" Bar BETTS Horizontal floor type, 50" face plate
6'—vertical travel, modern, 4-motors.
3" Bar Universal TRI-WAY Horizontal, P.R.T.
3½" Bar No. 32 GIDDINGS-LEWIS
4½" Bar N.B.P. Table type.
24" New Era, BULLARD
54", 60" and 72" COLBURNS, two heads.
72" KING, Two Swivel Heads.
14' BETTS, Heavy, late type
14-20' N-B-P Extension type boring
2 swivel heads, all geared feeds.
16' NBP 2 swivel heads.



12' BETTS Extra heavy Double Drive, 30 H.P., 230 volt D.C., 2 swivel heads.

LATHES



48"x40' SIMMONS Heavy Geared Head Engine Lathe, AC or DC (new 1942)

30"x18' AMERICAN 12 Speed, G.H.
30"x23' AMERICAN 12-speed, G.H.
36"x32' NILES, "Timesaver".
36"x32' AMERICAN, 16 speed geared head
42"x34' LEBLOND late type.
48"x40' SIMMONS, Geared head.
60"x30' NILES Heavy Duty Geared Head, M.D. (Built 1942).
60"x31' (20' centers) NILES, 16-speed G.H. Lathe (New 1942).
90" PUTNAM Driving Wheel Lathe with journal truing and Double Quartering.
No. 2-H LIBBY, Full Universal Cross Feeding Turret.
3-AL GISHOLT, Hardened Ways.

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ENGINEERED Machine Tool REBUILDING

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Aldridge Pump Co. Vertical Triplex HYDRAULIC PUMPS, 2¾"x8", equipped with Herringbone Gears, 67.5 gpm. Maximum pressure for intermittent duty 2,200 lbs., for continuous duty 1,800 lbs. Pump and motor mounted on common bed plate. Motors are 75 HP, 3/60/220-440 volts, 740 RPM.

Complete with starting panel, consisting of G.E. motorstarter switch, push button control, square "D" Switch, and capacitator. Purchased new 3½ years ago. Excellent condition. *Available for immediate delivery.*

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Power Shears 52" & 72"
Power Presses, 5, 10, 14, 18 & 30 tons, O.B.I.
Spot & Arc Welders
Abrasive No. 1½ Surface Grinders, M.D.
Racine 6 x 6" Hacksaws, M.D.

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Bliss #304, 56 tons, 8" str., 18x18"
Bliss #6, 125 tons, sgl. & dbl. act. 24x30"
Bliss #7, 180 tons, sgl. & dbl. act. 24x36"
Bliss #7, 88 tons, 4" to 8" str., Horning
Cleve #10S, 90 tons, 8" str. 22x22"
Bliss #87½, 200 tons, 16-30" str., 28x28"
Bliss #88, 250 tons, 10" to 30" str., 29x29"
Clearing F1250—22, 250 tons, 22" str., 32x42"
Toledo 59½S, 500 tons, 8" str. 31x31"
Bliss 26A, 800 tons, 5" str. Knuckle
Clear. K800, 800 tons, 6" str. 42x42"
Vers. 40K, 1000 tons, 4" str. 36x36"
Natl. Maxi. #6, 2000 tons, 12" str.
Fed. #0—7 tons, dial feed (new)
Bliss #58, 18 tons, 5" str. 12½x13½"
Fed. #3, 30 tons, 8" str. 14x24"
Ferr. C22—Duplex, 15 tons, 5" str. 18x24"

Lathe, Simmons 48"x20' c-c
Lathe, Pittsburgh, 50"x14' c-c
Planer Cinc., 60"x60"x14', H.D., dbl. housing
Boring Mill, Betts 96", 4 Heads
Ceco Stamps 24"x30", 36"x48", 48"x48", 48"x66", 60"x156"
Rotary Shear ¾" Model #50A Quickwork
Pneumatic Drop Hammer, 36"x48", 3000 lb. Head
5" Acme Upsetter (1944)
300,000 lb. Drawbench—20,000 lb. Drawbench
HYDRAULIC PRESSES 75 tons to 5000 tons

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(INDUSTRIAL ENGINEERING SERVICE)
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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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Ferracute No. SG-53 Double Crank Press
No. 13 Brown & Sharpe Universal Grinder, M.D.
No. 3 Abrasive Surface Grinder.

MONA MEMBER

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LATE MODEL MACHINE TOOLS AVAILABLE

BORING MILLS

36" KING & BULLARD Vert., M.D.
3½" GILBERT Table Type, M.D.
#25-C DEFIANCE Table Type, M.D.
#360-F GIDDINGS & LEWIS, Floor Type, M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.

GRINDERS

#10 B & S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#5 B & S Plain Grdr., M.D.
4"x12" LANDIS Type H Plain, M.D.
14"x168" NORTON Type "C" Plain, M.D.
#4T SELLERS Tool Grdr., M.D.
9" P & W Hvd. Gear Grdr., M.D.
#11 BLANCHARD Rotary, 16" & 20"

LATHES

18"x72" MONARCH 8-Speed Geared Head
42"x132" AMERICAN "SUPER PRODUCTIVE", M.D.
50"x17' centers LEBLOND "BIG SWING", M.D.

MILLING MACHINES

#1H-12 K & T Mfg., M.D.
#2HL K & T Plain, M.D.
#8½D GORTON Univ. "SUPER SPEED" Vert., M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#2MS CINCINNATI Vert., M.D.
#3MS CINCINNATI Vert., M.D.
#3HS CINCINNATI Vert., M.D.
#3K K & T Vert., M.D.
#4 CINCINNATI "Hi-Power" Vert., M.D.
#5H K & T Plain Heavy Duty, M.D.
#5/60 CINCINNATI Duplex Hydromatic, M.D.
#12-M MOREY 2-spdle PROFILER, M.D.

PRESSES

#4½ BLISS SS, Double Action, M.D.
New HUB 15 ton OBI, M.D.
New U. S. Press, 12 ton, M.D.

RADIAL DRILLS

4'9" CINCINNATI BICKFORD "SUPER SERVICE", M.D.
4'11" CINCINNATI BICKFORD, M.D. thru gear box.
7'17" AMERICAN "HOLE WIZARD", M.D.

TURRET LATHES

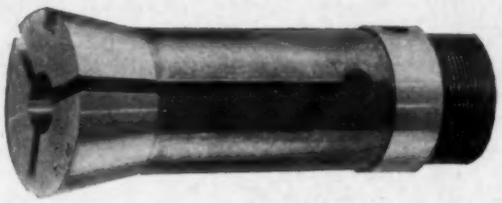
#0 B & S Wire Feed Screw Machines, M.D.
#4 W & S Ram Type Univ., M.D.
#5 J & L Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.

MISCELLANEOUS

#36BM GOULD & EBERHARDT 3-spindle Gear Roughers.
#22 HEALD Rotary, 12" chuck, M.D.
6"x48" THOMPSON Broach Grinder.
32" OHIO Heavy Duty Shaper, M.D.

Wigglesworth Machinery Co.
203 Bent St. Cambridge, Mass.

LARGE STOCK OF NEW & USED COLLETS



Also—Feed Fingers—Pads—Threading Equipment & Parts—Double Deck Tool Holders—Cams.
R. A. 6 Gridley Automatics—1¼", 1⅜", 1⅝", 2⅜".
Mod. 60 & 61 New Britain—Namco Die Heads.
Collets for Gridley Model F, ¾", ⅞", 1¼", 1⅜", 1¾", 2¼, 2⅜", Automatic Mach.
Extra large stock of 2⅜" R.A. 6 Gridley parts and collets.

We have a large stock of used collets and parts for Acme, 52, 53, 55 & 56, Acme Gridley, Cleveland, Cone, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and New Britains.

GRAFF MACHINE TOOL COMPANY
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THREAD GAGES — PLUG AND RING

Slightly used, NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
LESS 75 Percent Discount.

ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
LESS 75 Percent Discount.

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173 GRAND STREET NEW YORK 13, N. Y.
Send For Our Bargain Circular

McDONALD USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive #3-B M.D. Horiz. Surf. Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes
American 24'x12 grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fostermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 N. B'way., St. Louis 6, Mo.

LIKE NEW

#3 W & S UNIV. TURR. LATHE (1945)
3K MILWAUKEE HOR. PLAIN MILLER 1943
#2LMS—L-G 20" HSBB DRILL—8 SPEED
#2LMS—L-G 26" HSBB DRILL—8 SPEED
22"x48" CTRS. MONARCH LATHE MODEL CM
#2 CIN. PLAIN HORIZ. H.S. DIAL TYPE MILL
#2 & #3 CINN. VERT. H.S. DIAL TYPE MILLS.
#2MH CINCINNATI HORIZ. PLAIN MILLS.
12"x30" CENTERS MOD CK MONARCH TOOL ROOM LATHE WITH DOUBLE ANGULAR ATT. SWING 17½ (1943)
#2H MILWAUKEE VERTICAL MILLER
2A REID AUTO. SURFACE GRINDER
All machines late type, guar. with AC-MD

NEW 56" LYNN HYD. PRESS BRAKE, CAP. 56"x14 GA.—48"x12 GA.—36"x10 GA.

JULIUS J. SCHNEIR & CO.
609 W. Washington Blvd.
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FOR SALE AT FRACTION OF ORIGINAL COST

(3) Practically New (1943) Model #49 New Britain Gridley four-spindle Chucking Machines, Chuck Vise 9".

ORIGINAL COST OF $15,000 each.

Our Price for quick removal . . . $1750.00

Machines absolutely equal to new. Can be inspected in our warehouse.

WINSTON MACHINERY CO., INC.
517 South Delaware Street
Indianapolis 4, Indiana

———WANTED———

URGENTLY REQUIRED

#14-16-18 Gage—Hot rolled sheets
#18 Gage—Cold rolled sheets
Large tonnage of standard size sheets required.

Kamis Engineering Company
Third & Moore Streets
Philadelphia 48, Pa.

NEW—SPOT DELIVERY

POWER PRESSES Make	Tons	Stroke	Type
(5) V & O #0	5	2"	OBI-Dial Feeds
(2) Federal #0	6½	1¾"	OBI-Dial Feeds, geared mot
(6) V & O #2	17-25	4"	OBI-Dial Feeds, geared mot
(11) Wat-Farrel	25	3" up-3" down or single action 3"	C Frame-Double Action, Dial Feeds (or single action)

SAWS —Kalamazoo Metal Cutting Band Saws, Horizontal

SHEARS—(Foot) Frederick complete 36" x 18 G cap.
(Power) Pexto 6' x 16 G Gap

BRAKES—Press type, all steel, Lynn Hydraulic, motor self contained, 56" x 14 G (also used for punching)

ROLLS —Initial type, Frederick, 36" x 22 G, Hand.

POWER PRESSES

Make	Tons	Stroke	Die Space	Shut	Type
(2) Bliss No. 18	10	1½"	8½" x 14½"	7"	OBI
Max Ames	15	2"	9" x 18½"	6"	OBI Roller Feed 3" x 2" & Cutter
(5) Bliss #58	20	5"	7½" x 15"	10"	SS, gap, single action
Bliss #39	20	2"	—	—	Horn
(4) Ferracute C22 Duplex	20	5½"	12½" x 18"	12"	Gap, single action, SS, Duplex, Hopper Feed
(2) Bliss #62A	30	8"	14" x 24"	17"	SS, Gap, single action Hopper Feed
(2) Federal #3	30	8"	14" x 24"	17"	SS, Gap, single action, Hopper Feed
Bliss #68C	35	1-2½"	21" x 10½"	7"	Arch, DA
(3) Mystic No. 5A	40	6"	14" x 17"	14"	Embossing & Moulding for Plastics
Torrington	40	1-2"	23" x 16"	6½"	SS-DA

Make	Tons	Stroke	Die Space	Shut	Type
Bliss #18	43	3-6"	14" x 26"	8¼"	SS-DA, Gap
Bliss #02	45	4"	22" x 47"	9"	SS, Gap, dble crank, Single Action
(2) Bliss #52	45	2"	14" x 15"	9½"	SS
Wat-Farrel	50	Eyelet			6 Plunger
Bliss #4 Header	56	8" & 6"	1½" x 2½"	—	Horizontal Double Header Single Die
Toledo #54	60	3"	18" x 18"	12"	Trimmers-Shear
Bliss #57	75	2"	18" x 18"	11"	SS-Trimming
Stiles Parker	75	3"	24" x 32"	12"	Open Back Inclinable
Bethlehem	88	2½"	60" x 60"	—	SS, Dble crank, single action
Minster #50-5½-84	106	3"	34" x 84"	13½"	SS, SA, Dbl Crank
Toledo #59½S	500	8"	31" x 31"	29"	SS-DA, Twin Drive
Lake Erie Hydraulic	1320	36"	80" x 60"		Pump and Motor 1943
Lake Erie Hydraulic	2500	38"	133" x 120"	42"	Pump and Motor 1944

BRAKES—(Power) with motors.
D & K 5' x 10 G Box & Pan 13 fingers
D & K 8' x 16 G apron
New—Lynn 56" x 14 G Press Hydraulic, motor, self-contained (also used for gang punching)

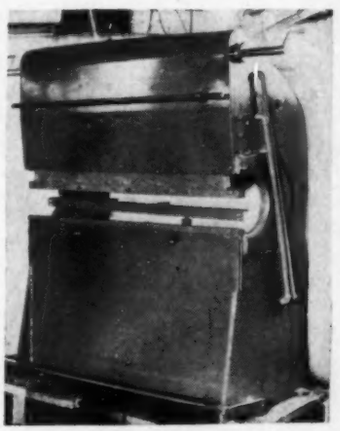
SHEARS—(Power) with motors
Niagara 5' x 14G (gap)
Pexto 6' x 16 G (gap)
Bliss 42" x 14 G

CRANKSHAFT GRINDER—Landis 16" x 48"

(6) TWO-WAY WIRE MACHINES

(2) Combination Punch & Shears. Sizes 13 & 18

SPOT DELIVERY
Lynn Hydraulic STEEL PRESS BRAKE
CAPACITY 56" x 14 GAUGE
IT'S SMOOTH . . . IT'S FAST . . . IT'S OPERATED HYDRAULICALLY



FRONT VIEW

The Lynn Hydraulic Press brake offers innumerable advantages not found in conventional brakes. It's fast, its operation is smooth, and possesses great flexibility! The machine is compact, taking up but a minimum of floor space. Its streamlined, pleasing appearance is a decided asset to any plant. Installation time is negligible. The hydraulic power unit and motor are completely enclosed.

No Clutch ***No Gears***

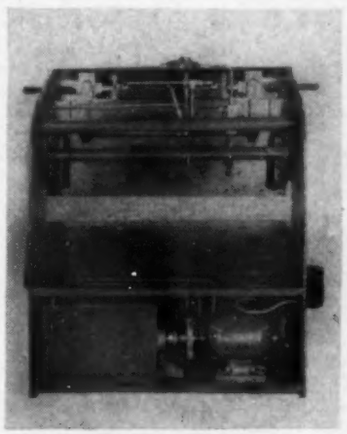
Complete with Adjustable Bar Gage

Smooth, Hydraulic Operation

Self-Adjusting Ram—No Trial Run Necessary

SPECIFICATIONS

Length between Housings	54"
Length of Bed and Ram	56"
Bending Capacity, Mild Steel:	
No. 14 gage over ⅝" V die	56"
No. 12 gage over 1" V die	48"
No. 10 gage over 1⅛" V die	36"
Depth of Throat	8"
Stroke	4"
Ram adjustment—Automatic adjustment, Hydraulically	
Die space above die holder	7-1/16"
Die space with die holder removed	9-1/16"
Strokes per minute	50
Approximate weight	3,500 lbs.
Motor	5 H.P., 1,750
Over all height	72"
Over all R to L	52"
Over all F to B	28"



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KINGS COUNTY MACHINERY EXCHANGE
394 ATLANTIC AVENUE, BROOKLYN 2, N. Y.
Phones: TRiangle 5-5237, 5-5212, 5-5213
WIRE — PHONE — WRITE

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For Machine Tools, Stamping Presses, Structural Machinery, Forging Equipment, Hydraulic Equipment, Air Compressors, Production Equipment.

OUR SERVICES ARE ALWAYS AT YOUR DISPOSAL

EMERMAN MACHINERY CORP.

875 W. 120th STREET **CHICAGO 43, ILLINOIS**

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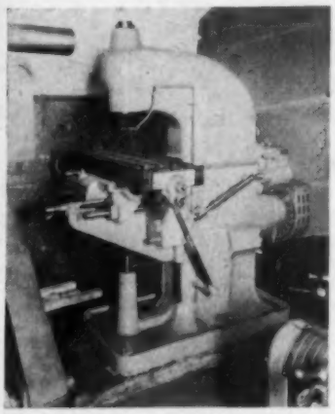


Milwaukee 1½B all geared vertical milling machine less motor $1200.

LATE MACHINE TOOLS

BRYANT Internal Grinder 24x36—1942, $4000.

CINCINNATI #4 Plain Milling Machine, Rectangular over arm, $1750.

AMERICAN geared head Lathe, 36" x 25' C.C., 16 speeds in head, $3800.

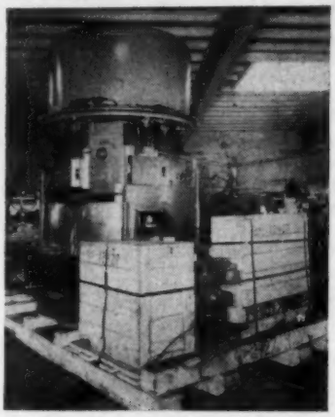
BARBER COLMAN #3 Precision Gear Hobbers, 1943.

WARNER SWASEY #3A Turret Lathe, serial 322787, $1400.

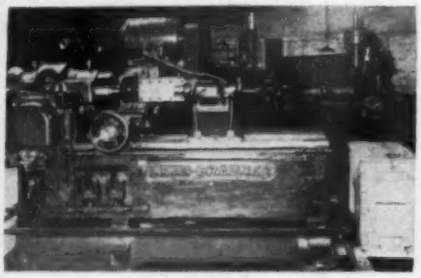
Late ACME GRIDLEY RB 6, 2⅝"; RA 6, 1¼"; RA 6, 1".

NEW BRITAIN 6 spindle, Model 61, 2¼", 1⅝", 1".

MANY OTHER GOOD MACHINE TOOLS.

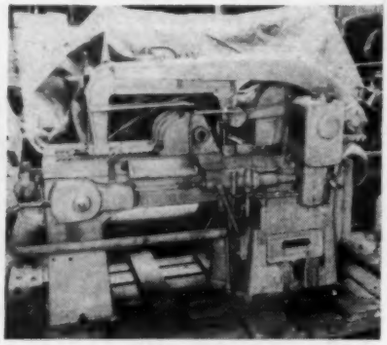


Bullard 6 spindle 12" 6 spindle Multaumatic less motor $3000.



Lees Bradner HT 12x36 thread miller with extra gears 1942 $2100.

York plate edge planers 10'—12'—15' double heads reversing motors $1200 each.



Racine hydraulic shear cut saw 10" with table $1300.

GENERAL MACHINERY AND EQUIPMENT CO.

180 S. 15th STREET HARRISBURG, PA.
Warehouses in Lancaster and Philadelphia, Pa.

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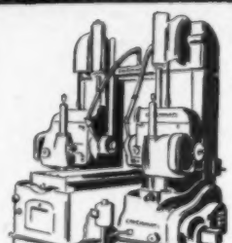
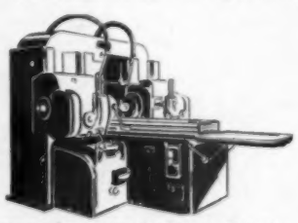
CINCINNATI #5-60 HYDRO-MATIC DUPLEX MILLERS



With Rise and Fall Attachment
NEW — NEVER USED!
SAVE OVER $15,000 ON THIS BARGAIN!

Table . . . . . 78" x 20"
Vert. Adj. Spindles . . . . . About 20"
Max. Width, Spindle to Spindle . . . . 28"
Main Motor 20 H.P. 220/440-3-60



Same Dimensions As Above, Except Spindle Adjustment is About 12".
Used About 4 Months!
SAVE OVER $7,000!

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NEW OBI PRESSES 35 TO 70 TON—GOOD DELIVERY

1⅝" Greenlee 6 Spld. Automatics, 1941

#1—P R & K OBI Press (2)

6 ton Fox "Superflex" Press

10"x36" NORTON PLAIN HYDRAULIC GRINDER, 1941, 5" face wheel

#1B Milwaukee Univ. Mill, M.D.

11"x5' Sebastian Gold Seal Lathe GH. T.A., Motor in base

#2 Baker Keyseater, M.D.

All these are but a partial listing. Your inquiries for any Metal Working Equipment are welcomed.

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CAdillac 3103

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received by 10 A.M. April 9th will appear in the April 24th issue, subject to space limitations.
Classified Advertising Division.
AMERICAN MACHINIST
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this Searchlight Section of

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And, when you have special items to dispose of, use the Searchlight Section of American Machinist to help you locate buyers. . . . Send a list of your equipment and we will gladly give information as to space and rates.

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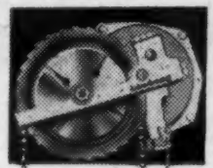

Spur Gear Hand HOISTS

We added a hook to a surplus bomb hoist to make this brand new piece of factory and machine shop equipment.

Ideal for all kinds of stationary lifting . . . over lathes, grinders and work benches. Uses are many in motor repair shops and boat yards.

Aluminum housing, steel gears, bronze bushed. 20 ft. of wire rope, multi-strand, complete with hook. Ball operating chain with easy release. Simple to install on beam or girder.

Hoists are unused, clean and guaranteed to be mechanically perfect. Lifting range from 300 to 500 pounds. Gear ratio: 5 to 1.

Price: $10 each

Postpaid in U. S. A.

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$500,000 SURPLUS TOOLS
at 25% to 75% of Cost

50,000 Tool Bits—Carboloy, Kennametal, Vascoloy, Circle "C", Bonded Carbide, etc.

30,000 H.S. Drills, Long length, core, taper and straight shanks, also plastic drills—patented.

30,000 Reamers, H.S. and Carbide. Sizes from 1/16" to 2".

40,000 Milling Cutters—Saws, Counter borers, Sinks, End mills, etc.

25,000 H.S. Taps all sizes in N.F. and N.C. also Nibs.

All tools are new either H.S. or Carbide and made by leading manufacturers.

Machine Products & Tools Co.

3134 Superior Ave., Cleveland, Ohio

Cherry 1148

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4 FASCO TURRET LATHES

12" swing, 30" bed, barfeed, 2¼" collet cap. Power turret, hand feed, Timken Bearing, SHP mtr. and transmission, pan bed. Priced, F.O.B. St. Louis $395.00.

KELLY & CO.

2007 OLIVE ST. ST. LOUIS 3, MISSOURI

FOR SALE

15—K. R. Wilson Hydraulic Presses, Model SPB, 25 Ton Capacity, hand operated. Also, Arbor Presses, Degreasers, Air Compressors, Paint Sprayers, etc.

GIRARD MACHINERY & EQUIPMENT CO.

134 S. Second Street Reading, Pa.

#2 CINCINNATI DIAL TYPE VERTICAL MILL MACHINE

Practically New—Serial No. 4A2V1J-27—5 H.P.—220/440 Volts—3 Ph Motor, $3950—F.O.B. Rochester.

BISON MACHINE CO.

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Let Our Large Scale Rebuilding Facilities Quality of Work and Efficiency Eliminate Your Machine Tool Problems

★ PRESSES

1—Farquhar 100 Ton Hydraulic Press—Daylight 48", stroke 36", approach & return speed 1600' per min.—given max. variation 15%, wght. 44,000 lbs. elect. equip. 440/3/60. (Condition—equal to new).

Elmes Hydraulic Press, 350 Tons Built-in Hydraulic Pump—Strokes of Ram 20", motor driven.

★ HOR. BOR. MILLS

1—Lucas #43 Precision Hor. Bor. Mill, M.D., tbl. 36"x72", spin. diam. 4½", dist. from spin. nose to face of tailstock 84".
1—Lucas #31 Precision Hor. Bor. Mill, M.D., tbl. 24"x48", spin. diam. 3", dist. from spin. nose to face of tailstock 60".
1—Univ. #3A Hor. Bor. Mill, with 3" bar.
1—Niles No. 72 Duplex control, horiz., M.D., 4½" bar.

★ VERT. BOR. MILLS

Bullard 24", 36" New Era Type, (2) 36" and 54" "Spiral Drive" Vert. Bor. Mills.
1—14' Sellers, 2 heds. on cross rail, elect. equip.

★ MILLING MACHINES

1—B. & S. #1½A Univ. Miller, tbl. wkg. surf. 36¼"x8¼", power feed: long. 20", trans. feed 7", vert. 18".
1—B. & S. #2A Univ. Miller, dbl. overarm, motor in base, tbl. wkg. surf. 45"x11¼", power feed: long. 28", cross 10", vert. 18".
B. & S. No. 2 Light Type, Horiz. Miller, latest type, tbl. wkg. surf. 45"x10", all power feeds: long. 28", cross 10", vert. 15".
1—Milwaukee 2K Vert. Miller, 750 R.P.M. with rotary table.

★ LATHES

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D., AC elect. equip. power rap. trav. to carr., compound rest. 2 steady rests, sw. 38" over bed, 20" over carr., dist. betw. cens. 48'.
1—American 24"x12', 12 speed, Eng. Lathe, M.D., sw. over bed 27½", dist. betw. cens. 84". Rebuilt equiv. to new.
1—Whitcomb-Blaisdell 24"x10', QCG, DBG, Heavy Duty Eng. Lathe, M.D., dist. betw. cens. 48", sw. over bed 26".
1—Le Blond 21"x18' Heavy Duty Eng. Lathe, M.D., sw. over bed 21¼" dist. betw. cens. 153", mtzd.—Good Condition.
1—L. & S. 27"x18', 12 speed, sel. hed., Ser. No. over 27,000, M.D., sw. over bed 30½", dist. betw. cens. 144".
Hendey 14"x6' grd. hed. and 14"x6' and 18"x6' Yoke Hed., Tool Room Lathes, with taper attmts.

★ SHAPERS

Brand new—1—Gemco 20" Univ. Shaper, power down feed.
Gould & Eberhardt 16" Crank Shaper, bk. grd., with tilting tbl., M.D.
1—Davis 16" Crank Shaper, multi-V-Belt motor drive. Strokes per min. 12 to 94.

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B. & S. No. 4 Univ. Grinders, cens. sw. 14", dist. betw. cens. 60". (Late type)
B. & S. #1 and 2 Univ. grinders (Latest Type)
Blanchard #11, 16, and 18, Vertical Surface Grinders with 16", 30" and 36" Magnetic Chucks,—Very latest type.
1—P. & W. 22" Vert. Surf. Grinder, M.D., tbl. wkg. surf. 4'x18", tbl. top to new wheel 17".

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75 TON HORNING PRESS

No. GA 127 Pexto, 23½" throat, 12"x18" bed, bed integral with horn, bank geared, motor drive, excellent condition.

FRANK J. LUNNEY

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Belt Cutters, 1"-1½"-2"-2½"-4" Acme, Landis.
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Millers, Plain No. 3 K & T, No. 4 Cin.
Planer 36"x36"x12' Powell 4 Hds.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

West Penn Machinery Company

1210 House Bldg. Pittsburgh, Pa.

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215 TON CLEARING MECHANICAL PRESS—Type S.O. 832—Stroke 10" Shut Ht. 18"—Single Action New 1940 Bed—29"x32".

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LATE RAM TYPE TURRET LATHES

#5 W & S Univ., New 1942
#4 W & S Univ., New 1942 & 1943
#3 W & S Univ., New 1942 & 1943
3 J & L Univ., New 1942 & 1944
#1 B & S Screw, New 1945 (7)

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STAINLESS STEEL BARS

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MORE ENDURO Stainless Steel Bars—because of greatly increased facilities. Republic's capacity now is second to none. An entire plant, shown above, is devoted exclusively to the production of cold finished ENDURO Bars and Wire. From now on, you can order these ENDURO products for delivery virtually as desired.

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If you use hot rolled or cold finished stainless steel bars or wire, talk to your nearest Republic District Sales Office or ENDURO Stainless Distributor about delivery schedules, or write us. And don't forget that Republic metallurgists and machining engineers are ready to help you get best results from these products.

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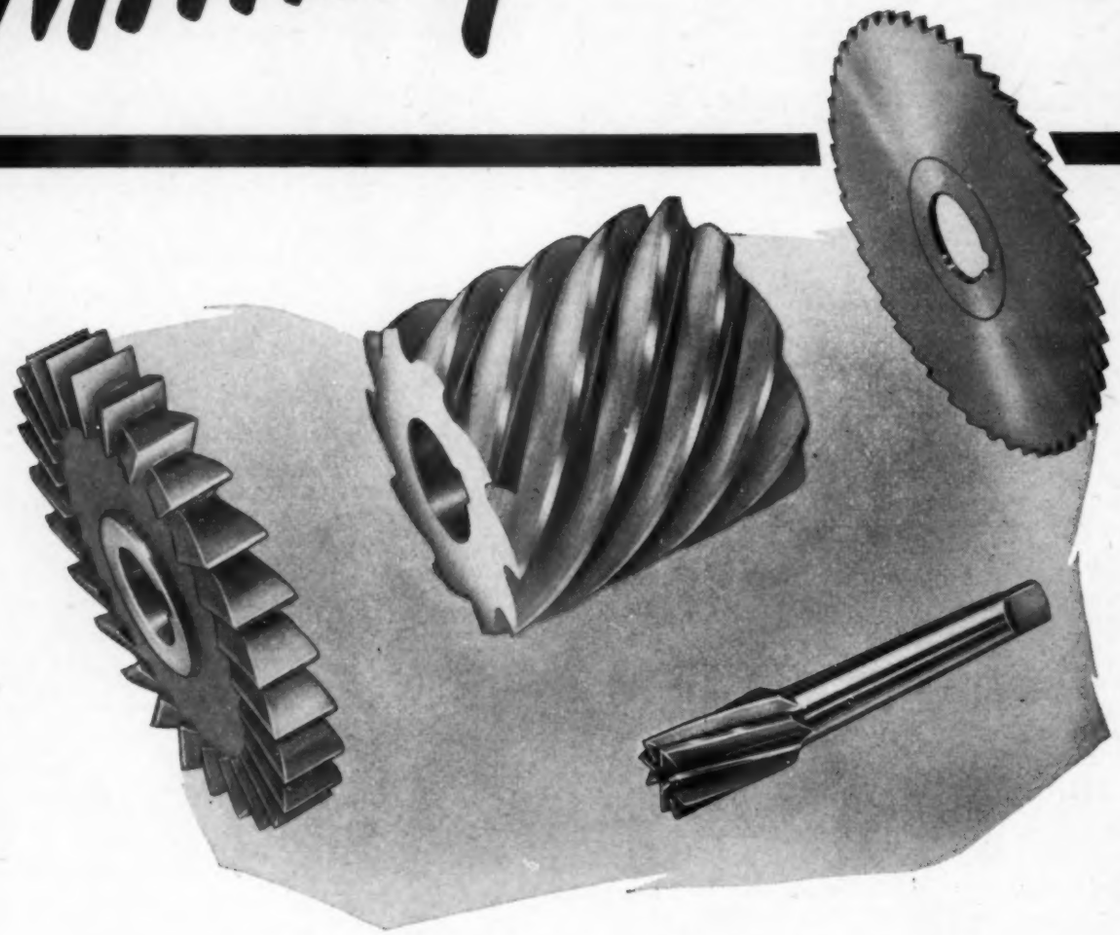
Milling Cutters



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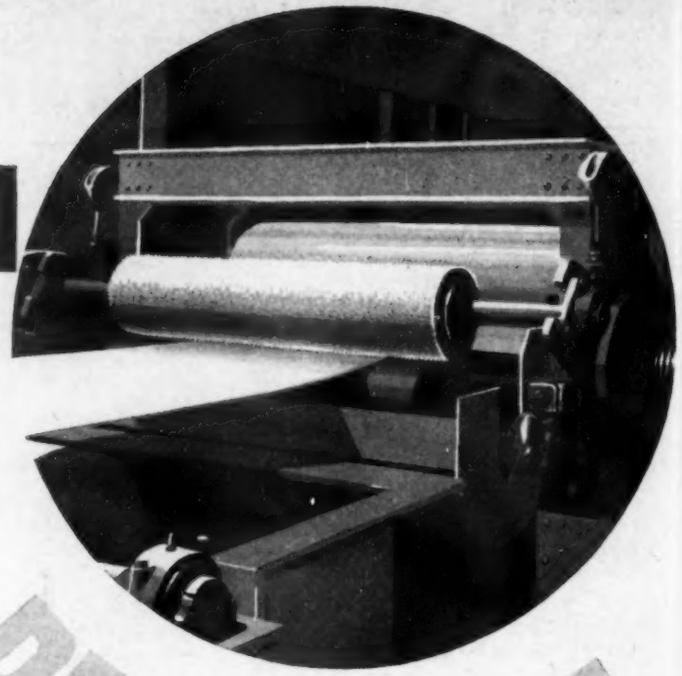
How to give a cold rolled strip the BRUSH-OFF



● A characteristic problem of cold roll strip production is the removal of oil and other foreign matter. Pittsburgh has solved this by a 3-color, dense filled, medium stiff brush. This special brush of even trim, spiral wound, removes all rolling oil and other foreign matter after the strip has passed through a heated alkaline bath and been sprayed by clear water.

Such a brush has to take plenty of punishment for it is constantly subjected to both the softening effect of water and rapid friction of the strip. Brushes by Pittsburgh are skillfully and durably built to withstand this heavy going.

Why the Pittsburgh Plate Glass Company Makes Brushes

As a leading manufacturer of paints, Pittsburgh found that a reliable source of quality brushes was necessary for the proper application of its products. For over 40 years, Pittsburgh has made its own paint brushes. It was a natural step to extend its engineering and manufacturing facilities by developing production, maintenance and power-driven brushes engineered to the specific needs of industry.

It pays to use power-driven brushes by Pittsburgh

● You can depend on Brushes by Pittsburgh for top performance, enduring economy, and a minimum of lost time in changeovers. In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and section assemblies, Uni-Fill scratch brushes, as well as paint and other maintenance brushes. ● Consult the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing requirements.

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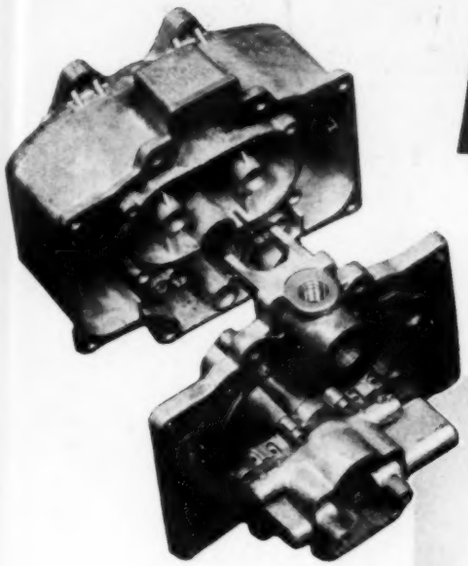

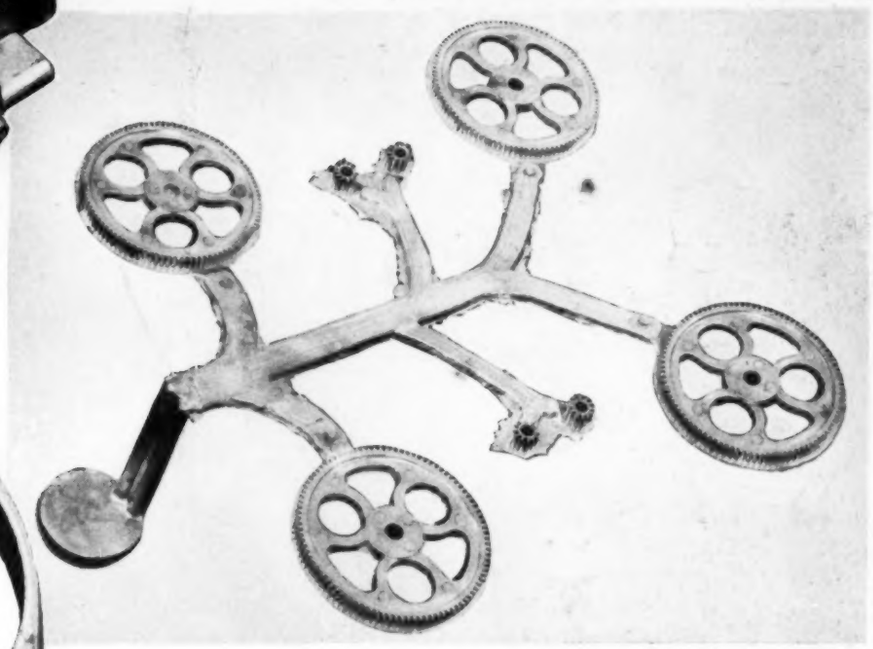

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Seven years ago the General Industries Company, Elyria, Ohio, purchased a No. 3 Warner & Swasey Turret Lathe equipped with Timken Tapered Roller Bearings on the spindle and at other important positions.

The lathe is used for machining special hard plastic parts used in Rayon manufacturing equipment where acid conditions make metal parts impractical. These hard plastic parts are faced, bored and turned to close tolerances (.002" - .004") with a spindle speed of 1480 R.P.M.

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After 7 years of continuous 3 and 2 shift operation (equal to 19 years of single shift service) Mr. John H. Curtiss, Assistant Superintendent of the General Industries Company recently wrote us as follows: "I have watched this machine throughout all of its life here and it has given excellent service. The bearings of course deserve a share of the praise. I think it remarkable that the spindle bearings have held up so well. As far as I can see the spindle runs as smoothly as when new."

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